

Research Abstract

Title – Transverse Third-Damper to Improve Suspension Systems for In-wheel Motor Driven Electric Vehicles

Program of Study – Mechanical Engineering

Presentation Type –Physical Poster

Subtype – Applied

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Abstract: This project consists of designing and testing an experimental test bed to validate computational results, obtained from the analysis of a transverse damper suspension system. This experiment examines the frequency analysis of a suspension system, including the transverse third-damper, while increasing the unsprung mass by 40 kg, 60 kg, and then 80 kg. Increasing the unsprung mass allows the examination of the vehicle's road-holding capabilities to work towards placing electrical motors in the wheels of an electric vehicle. The test bed uses a motor-powered conveyor belt to test the vehicle's back wheels. The conveyor belt rotates the vehicle's back wheels to mimic driving on the road. A rubber block is then secured on the conveyor belt to act as a common obstacle on the road that is consistent with the obstacles usually encountered daily. Specifically designed 20 kg steel plates are placed around the vehicle's wheels to increase the unsprung mass by 20 kg at a time. These steel plates are for the vehicle to drive over to test the frequency of the suspension system, which includes the transverse third-damper. Multiple Industrial Sensor Evaluation Kits are placed on the vehicle's unsprung mass to measure the suspension system's resonant frequency and amplitude ratio in multiple places. In creating the

test bed, it is evident that the resonant frequency and amplitude ratio will change once the unsprung mass is increased by 40 kg, 60 kg, and 80 kg, respectively.

Christian worldview integration: Creationeering is the main thing that sets Liberty University apart from other Universities. Liberty University's prime focus is God being the chief engineer and designer. In concordance with Liberty and our personal beliefs, our research is based on these core values: that Jesus Christ is our Savior and that we should further His Kingdom by spreading the Gospel. This core belief is exhibited throughout our research because God is the center of everything, as the Chief Engineer. He has created all, and through Him, all things were created. Throughout our research, we are consistently reminded that God gave man the ability and tools to make and use every resource in our research.

We recognize that God has given us the ability to be Creationeers and that our current and future research should be used to further His Kingdom, which can be done by making needed advancements to human technologies. For this experiment, the need is electric vehicles. Electric vehicles have stormed the market in America and worldwide, being made famous by brands like Tesla. This advancement created more opportunities for engineers to better their current designs. Our research project involves increasing the performance of electric vehicles by using more efficient suspension systems and placing electric motors in the wheels. Through the design of our experiment, it is clear to see how this experiment can later impact electric vehicles around the world—allowing for more improved road-holding at a cheaper cost. This is impactful to the community because it improves the performance of the vehicles while creating more inexpensive cars for individuals who wish to purchase an electric vehicle. Continuous research must occur in our culture because, without research, our culture will remain neutral and without growth.