

Adapting a Fuel Cell Car Model to Commercial Vehicles

Relevance to the Automotive and Autonomous Systems Industries:	Fuel cells are important to the defossilisation of the transport sector. The application of fuel cells to commercial vehicles is particularly relevant because batteries do not always meet the high demands on energy storage. Fuel cells enable the efficient use of hydrogen to power vehicles.	
Research Location:	Technische Universität Darmstadt Institute for Internal Combustion Engines and Powertrain Systems (VKM)	
Homepage (Engl.):	http://www.vkm.tu-darmstadt.de	
Faculty Mentor:	Prof. Dr. techn. Christian Beidl	
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Graduate Mentor Emails:	endres@vkm.tu-darmstadt.de	
Project Description:	<p>The Technische Universität Darmstadt Institute for Internal Combustion Engines and Powertrain Systems (VKM) is investigating fuel cell powertrains and has therefore developed a passenger car simulation model. This NSF REU project will be concerned with the adapting this model to different commercial vehicles, including a heavy-duty truck.</p> <p>The objective for the NSF REU student is to identify the parameters to be adapted and then size them correctly to determine the optimal dimensions of the powertrain. The focus will be on the fuel cell system, which consists of the fuel cell itself and various auxiliaries such as the humidifier and the compressor. The successful outcome of this project will be an optimized fuel cell component structure for light- and heavy-duty vehicles that can be used for future research and development.</p> <p>PHASE A (2 weeks): During this introduction phase, the NSF REU student will learn how a fuel cell powertrain works; review relevant research; investigate existing software; identify important simulation parameters; and detail and distribute project responsibilities.</p> <p>PHASE B (4 weeks): Next, the student will adapt the simulation model to different vehicle types and investigate the influence of different component dimensions on the simulation result; and document this work.</p> <p>PHASE C (2 weeks): Then, the student will identify the most efficient and economic components and systems for these vehicle types; and investigate the coherences of the different components of the system with regards to vehicle efficiency.</p> <p>PHASE D (2 weeks): Finally, the NSF REU students will document the research performed, prepare a written report, and deliver an end-of-summer presentation on the research performed.</p>	
May 22 - Jul 28, 2023 (10 weeks, 40 h/week)		
Target publications:	<ul style="list-style-type: none"> Komponenten zukünftiger Antriebe – Produkte für nachhaltige Mobilität 	
Necessary Skills/ Knowledge:	<ul style="list-style-type: none"> Experience with simulation models 	
Desirable Skills/ Knowledge:	<ul style="list-style-type: none"> Experience with fuel cells Experience with powertrain simulation 	
Additional Online Resource(s):		

NSF REU Students must have completed at least two semesters of engineering studies prior to the proposed summer research, and they must have at least one semester remaining before they can earn their BS in Engineering.