

University of Virginia Human Powered Vehicle Team 2021 ASME HPVC E-Fest Design Report
(Technical Report)

A Moral Judgement Analysis of the Engineers of the Volkswagen Emissions Scandal through
Virtue Ethics
(STS Research Paper)

An Undergraduate Thesis Portfolio

Presented to the Faculty of the
School of Engineering and Applied Science
University of Virginia, Charlottesville, Virginia

In Partial Fulfillment of the Requirements for the Degree
Bachelor of Science in Mechanical Engineering

By

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Socio-Technical Synthesis

My mechanical engineering oriented technical work and my science, technology, and society (STS) research are connected through the idea of environmental sustainability and the affects to global warming through the transportation industry. The transportation industry accounts for a large amount of the greenhouse gas emissions which in turn has a large effect on the warming of our planet. A large amount of the greenhouse gasses emitted by the transportation industry can be accounted by the subsection of petrol and diesel engine automobiles. My technical work and research differ, however, in how they study and analyze the transportation industry. My technical work aims to provide technical solutions to the issue of greenhouse gas emission in the transportation and automobile industry. My research studies and analyzes a field case of immoral behavior in the car manufacturing industry. Although both projects have different goals and conclusions, they both relate in the theme of environmental conservatism in the transportation realm.

My technical work aims to find a more sustainable and convenient solution to the automobile in the form of a human powered vehicle (HPV). My team (The University of Virginia's HPV Team), designed and created a new HPV in the form of a semi-recumbent tricycle style vehicle with a steel frame and cage to provide the user with protection, as well as a lightweight fairing to help with aerodynamic and efficiency. This new HPV is robust enough to be used in a variety of different terrains and uses and convenient enough to be used as an everyday commuter in a city like Charlottesville. The vehicle prioritizes the safety of the user frontmost, as well as comfort, convenience, and durability. Learnings from UVA's mechanical engineering program, as well as software such as 3D Computer Aided Design and Computational Fluid Dynamics, and machining skills such as welding and molding were all implemented into

the design and completion of this HPV.

In my STS Research project, I study a field case of Volkswagen's "clean diesel" engine vehicles and the moral compass surrounding the engineers who took part of the project. Volkswagen used a defeat device software to deceive governmental regulation as well as the general public on the emission count that many of their diesel vehicles produced. I used the ethical theory of virtue ethics to analyze the moral valance of the decisions and actions performed by Volkswagen's engineers during their "clean diesel" project. I claim that due to the lack of embodiment of some of Pritchard's virtues for morally responsible engineers: professionalism, ability to communicate clearly and informatively, and perseverance, Volkswagen's engineers acted immorally. I analyze specific decisions and actions made by these engineers and justify them as immoral behavior on the bases of the specified virtues listed above. To justify a group as immoral engineers, they must fail to embody just one of Pritchard's virtues for morally responsible engineers.

Working on both projects simultaneously added great value to the understanding and completion of both. By first researching and studying the effects of the petrol and diesel automotive industry on global warming in my technical report, I was able to understand necessary background and context for my research paper. Also, while studying the moral behavior of responsible engineers in my research paper, I was able to implement this into the design and manufacturing of our HPV and create an artifact that was moral, safe for the user, and effective in mitigating environmental damage. Working on both projects in tandem truly gave me the insight and confidence to pursue and complete each project with accuracy and morality.

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