

Thesis Portfolio

Yakski: An Electric Waterjet Propulsion System
(Technical Report)

**Examining the Rise of Electric Vehicles:
A Technological Fad or the Future of Transportation**
(STS Research Paper)

An Undergraduate Thesis

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

In Fulfillment of the Requirements for the Degree
Bachelor of Science, School of Engineering

David Gordon
Spring 2020

Department of Mechanical and Aerospace Engineering

On my honor as a University student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments

Table of Contents

Sociotechnical Synthesis

Yakski: An Electric Waterjet Propulsion System

Examining the Rise of Electric Vehicles: A Technological Fad or the Future of Transportation

Thesis Prospectus

Sociotechnical Synthesis

Since the industrial revolution, energy needs have exponentially skyrocketed as modern industries are reliant on various forms of energy. One of these modern industries reliant on large amounts of energy is the transportation industry. With growing concerns about the sustainability of the current energy landscape, the transportation industry has been looking to wean themselves off of non-renewable energy, like petroleum, and begin using cleaner, renewable energies, such as electricity. This has led to a revolution in the industry, as more and more transportation companies are beginning to invest in electric power to create a modern transportation system run completely off sustainable energy. The technical report had the goal to illustrate the feasibility of using electric motors to power a waterjet propulsion system to attach to a personal watercraft. The STS report aims to evaluate the current landscape of the automobile industry and how electric power will be integrated into cars in the future.

The technical report details the design and construction of the Yakski, an electrically-powered waterjet apparatus for a kayak or similar personal watercraft. By pairing an electric motor with a waterjet, rather than the conventional gasoline-powered propeller motors, the personal water craft will have more versatility in the water as well as produce zero harmful emissions to the nearby aquatic environment. The completed system utilized a two battery-powered motors to produce enough thrust to transport a kayaker at a reasonable speed as well as be steer and slowdown using a user-friendly control panel. The report delves into the design process and the various creative ideas prototyped that led to the final product. The report also breaks down the experimental performance of the Yakski prototype and where there was potential for improvement if the project were to continue. The technical report aimed to show the

process of transitioning a traditionally gasoline powered propulsion system to electric power and the challenges that come this type of energy change.

The STS report explores the rise of electric and hybrid electric power in the transportation industry, specifically exploring its rapid growth in the automobile industry. By employing the Social Construction of Technology framework, the report suggests that it is likely that electric power will have a place in the future of the automobile industry in some form given the current trajectory of the technology and its acceptance, but these two sides must continue to rise in parallel in order for the electric power to fully stabilize in the transportation industry. Numerous sociotechnical factors and stakeholders were broken down and outlined to synthesize the full scope of the industry and all the moving parts involved with shifting its energy source from fossil fuels to renewable electricity.

In conjunction, both the technical report and sociotechnical report deal with the idea of transitioning the transportation industry to electricity. The technical report provides the engineering example of the feasibility of using electric power for a transportation device, and the benefits as well as the drawbacks of using this form of energy on a controllable, experimental scale. The STS report considers the history and present of the automotive vehicles, and where electric power fits into the future picture of the industry and the sociotechnical obstacles in its way. Overall, both reports discuss the idea of electricity being the primary energy source for the future of transportation and what that factors are involved in this mass change in power.