

Thesis Project Portfolio

Educational Engine

(Technical Report)

The Future of Internal Combustion Engines in the Ocean Freight Industry

(STS Research Paper)

An Undergraduate Thesis

Presented to the Faculty of the School of Engineering and Applied Science

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In Fulfillment of the Requirements for the Degree

Bachelor of Science, School of Engineering

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Sociotechnical Synthesis

Introduction

Engineering advancements have enabled the development of an unprecedented global economy and supply chain. It relies upon systems such as the internet, raw material production, and transportation. As we now know, the ‘fossil fuels’ powering this infrastructure wreak havoc on the environment, an unfortunate byproduct.

Technical Project

My Capstone group was tasked with creating an interactive display aimed at teaching about the prolific four-stroke internal combustion engine. Despite its harmful emissions, the four stroke engine represents centuries of advancement and optimization, a modern engineering marvel. It seamlessly integrates many of the mechanical engineering disciplines, from mechanisms and dynamics to thermodynamics, heat transfer, and fluid flow. The product of this project was an interactive cutaway of a real four stroke engine, meant for use as a display or teaching tool for the students in the Mechanical and Aerospace Engineering Department. Additionally, it serves as an informative display for other passers-by.

The group also completed a preliminary project before the completion of the cutaway model, which was a fully 3D print-able four stroke engine model that is accessible worldwide to anyone with 3D printer access. This model shows the full functionality of a four stroke engine, including a camshaft and valve train. It is designed to work with Polylactic Acid (PLA, the cheapest and most basic 3D printer material), and to be easily printed without the use of glue, external hardware, or support material.

Thesis Topic

The general public is well aware of the climate crisis, and it has become commonplace to see fossil fuel alternatives, mainly electric vehicles (EVs), in everyday life. However, the public is generally unaware of the complex global supply chain that enables daily life. Through fleets of ships, trucks, trains, and planes, consumers worldwide enjoy products from across the globe. Intrigued as to how this industry impacts the climate crisis, I decided to research and write my thesis about the future of the internal combustion engine in the shipping industry (specifically ocean freight). This paper does a deep dive into the climate effect of this industry and the current technological state of alternatives.