PepsiCo Biodiesel Feasibility Analysis

PURDUE UNIVERSITY | School of Industrial Engineering

By Stephen Pangas, Manan Agarwal, Nubia Tomita, Jeff Santoso, William Carroll and Jolee Hedman

Client Background

- Global company with strong influence on the environmental aspect
- Company's fleet represents 20% of the total PepsiCo emissions
- Products: snacks, soft drinks, cereals, etc consumed over one billion times everyday
- Goal: reduce their reduce scope 1 and 2 GHG emissions by 75% by 2030

PEPSICO

Problem Statement

Our goal is to design a model that PepsiCo can use to analyze the economic, environmental and supply chain impacts of using B100 instead of regular diesel in its Fleet Operations.

Existing System Model

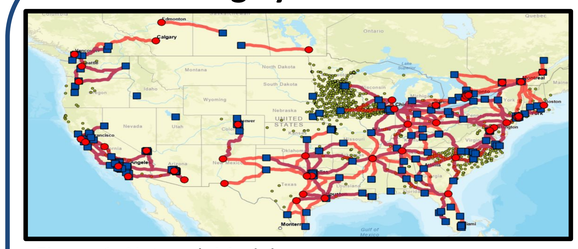


Figure 1: Network Model

PepsiCo asked us to model a Middle-mile route network (round trip < 800 mi), which we did using population centers to create an approximate generic network.

Methodology

Network Model

We built a model network map that superimposes the PepsiCo route beginnings and endings, as well as the biodiesel grid.

The network was based on the 250 most populous cities, with the top 50 as 'manufacturing' and the remaining as 'distribution' sites.

The routes we were interested in were 700-800 miles round trip

The viable fueling stations were assumed to be ones within 2.5 miles of the route.

Economic Models

1) The General Economic Model estimates B100 retrofitting costs over time with minimal user input and calculates its current value.

2) The Multi-Investment Economic Model is specific to PepsiCo, showing costs, returns, and breakeven points for different retrofitting investments.

Discussion

- **Recommendation**:

PepsiCo should implement B100 in their fleet because of the long term environmental impacts.

The network model revealed that the switch would be possible, especially once fueling stations started to offer B100 as well as B20.

- **Future steps**:

Gather specific data on engine and transmission performance is instrumental to improve this model's performance and predictions towards costs and emissions.

Compare B100 emissions and costs with those of the current B5 and B20 fleet, and also take into account possible variations in biodiesel sourcing and pricing in cost and emissions analyses.

Results

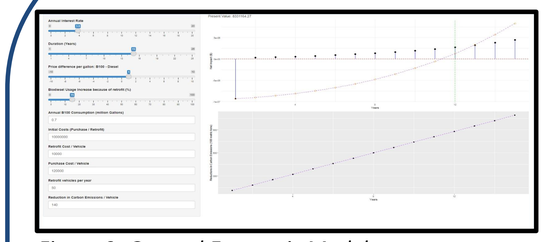


Figure 2: General Economic Model

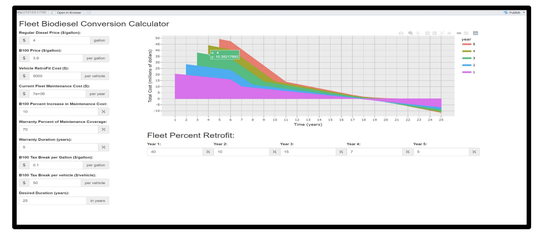


Figure 3: Multi-Investment Economic Model

While initial costs of acquiring a B100 fleet (or) retrofitting current vehicles to be B100 compliant are high, the net economic impact of a shift over a longer period of time is viable. Retrofitting even 50 vehicles a year (estimated at $500,000 per year) with an estimated initial purchase of 80 vehicles (estimated at $9,500,000) has the potential to have a net present value of around $1,500,000 over 15 years at a 3.8% annual interest rate. Also, there is a significant reduction in Carbon emissions as a result of using B100 (~141 metric tons / vehicle)

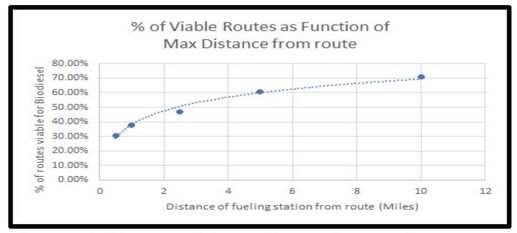
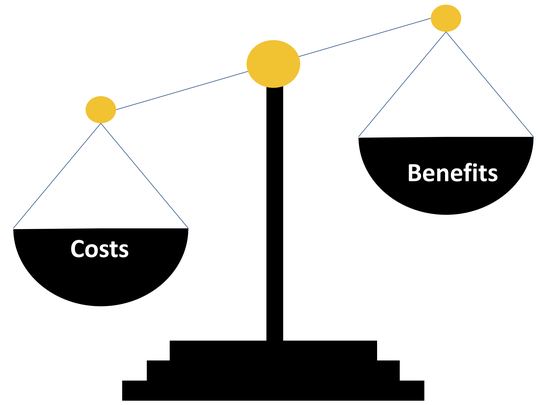


Figure 4: Network Model Viable Routes Analysis

PepsiCo could theoretically convert half of its middle-mile routes to Biodiesel using just commercial sources, but is constrained by a lack of availability and infrastructure. Obtaining B100 commercially would require a modest investment from retailers, but the fuel is available onsite.



- Retrofitting engines into the current fleet
- Variation of prices for B100
- Implementing Vector System

- Reduced costs and Emissions
- Achieving PepsiCo's Goal in the future

Financial — **Returns** — Non-financial