



**CALIFORNIA
ENERGY COMMISSION**



Clean Transportation Program

FINAL PROJECT REPORT

Skid-Mounted Biodiesel Blending System

Prepared for: California Energy Commission

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Gavin Newsom, Governor

July 2019 | CEC-600-2019-024

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Agreement Number: ARV-11-026

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ACKNOWLEDGEMENTS

We would like to thank all the help and patience of Eric Van Winkle as we went through the process of making this project a success.

PREFACE

Assembly Bill 118 (Núñez, Chapter 750, Statutes of 2007) created the Clean Transportation Program, formerly known as the Alternative and Renewable Fuel and Vehicle Technology Program. The statute authorizes the California Energy Commission (CEC) to develop and deploy alternative and renewable fuels and advanced transportation technologies to help attain the state's climate change policies. Assembly Bill 8 (Perea, Chapter 401, Statutes of 2013) reauthorizes the Clean Transportation Program through January 1, 2024, and specifies that the CEC allocate up to \$20 million per year (or up to 20 percent of each fiscal year's funds) in funding for hydrogen station development until at least 100 stations are operational.

The Clean Transportation Program has an annual budget of about \$100 million and provides financial support for projects that:

- Reduce California's use and dependence on petroleum transportation fuels and increase the use of alternative and renewable fuels and advanced vehicle technologies.
- Produce sustainable alternative and renewable low-carbon fuels in California.
- Expand alternative fueling infrastructure and fueling stations.
- Improve the efficiency, performance and market viability of alternative light-, medium-, and heavy-duty vehicle technologies.
- Retrofit medium- and heavy-duty on-road and nonroad vehicle fleets to alternative technologies or fuel use.
- Expand the alternative fueling infrastructure available to existing fleets, public transit, and transportation corridors.
- Establish workforce-training programs and conduct public outreach on the benefits of alternative transportation fuels and vehicle technologies.

To be eligible for funding under the Clean Transportation Program, a project must be consistent with the CEC's annual Clean Transportation Program Investment Plan Update. The CEC issued PON-11-062 to provide funding opportunities for the infrastructure necessary to store, distribute, and dispense electricity, E-85, propane, diesel substitutes, and natural gas. In response to PON-11-062, the recipient submitted an application which was proposed for funding in the CEC's notice of proposed awards April 24, 2011 and the agreement was executed as ARV-11-026 on July 16, 2012.

ABSTRACT

A skid-mounted biodiesel blending system was built and commissioned on April 30, 2015 in Watsonville, CA to make blends of biodiesel and diesel ranging from 5 percent to 20 percent biodiesel. This blending operation serves a variety of customers, from public agencies, Cal Trans and local school districts to private fleet operators and local farmers. It fills a vital distribution need and the range of influence extends from South Santa Clara County to San Benito, Santa Cruz and Monterey Counties. This skid-mounted blending system can be implemented quickly and at substantially lower cost than traditional petroleum blending racks, allowing it to be used by smaller distributors and biofuel companies.

Keywords: California Energy Commission, biodiesel, fuel infrastructure, skid-mounted blending system, B5, B20

Please use the following citation for this report:

Lekos, Orion, PhD. Whole Energy. 2019. *Skid-Mounted Biodiesel Blending System*. California Energy Commission. Publication Number: CEC-600-2019-024.

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EXECUTIVE SUMMARY

The goal of this project was to build and install an inline biodiesel blending terminal in California. The blending system was designed to be skid-mounted and easily installed. A prebuilt used skid-mounted system was found and purchased from Kinder Morgan in Richmond, CA and transported to the Richmond loading terminal. Although the equipment was perfect for the project's needs, the Richmond site did not have the power requirements to install it. A new site in Watsonville utilizing Northstar Biodiesel's facility was chosen. The skid was installed and began delivering biodiesel in blends of B5 (5 percent biodiesel) and B20 (20 percent biodiesel) to the surrounding valley on April 30, 2015. This blending operation serves a variety of customers, from Public agencies, Cal Trans and local School Districts to Private Fleet Operators including local Farmers. Filling a vital distribution need, the range of influence extends from South Santa Clara County to San Benito, Santa Cruz and Monterey Counties.

CHAPTER 1:

Project Purpose and Approach

Project Purpose

The purpose of the project was to add inline biodiesel blending capabilities to Whole Energy Fuels' biodiesel loading rack to increase the availability and use of blending biodiesel for local fleets. Traditionally, biodiesel has been "splash blended" as it was loaded into trucks. This meant refueling operators estimated the right proportions of diesel and biodiesel as each fuel was loaded into tanker trucks. The agitation from the trucks' on-road movements then blended the fuel. This method could not guarantee the correct blend levels, which put diesel truck engine warranties at risk.

The new project will use inline blending, whereby fuel products are piped from storage tanks and metered into tanker trucks. Electronic metering ensures that the appropriate blend levels are consistently piped into each truck. Whole Energy plans to increase biodiesel fuel sales by offering a more well-blended final fuel product that meets warranty specifications.

Whole Energy Fuels produces and distributes biodiesel to customers on the Pacific Coast from British Columbia to Northern California. Their current biodiesel sales range from 350,000 to 400,000 gallons per year (as per their 2012 grant application). They estimate that biodiesel fuel sales could triple to over one million gallons per year in annual sales by offering the more precisely-blended biodiesel fuel product. Increased sales and use of biodiesel would help to reduce toxic air emissions and carbon emissions by substituting biodiesel for petroleum diesel fuels. The magnitude of carbon emission reduction would depend on feedstocks and blend levels. Biodiesel from used cooking oil and other waste-based feedstocks offer lower carbon intensity values than biodiesel derived from soy beans.

Project Funding

The Energy Commission grant for this project totals \$125,274. Whole Energy Fuels matched this funding with \$153,000.

Project Approach

The initial approach proposed for this project was to design and build a skid-mounted inline blending system for installation at Whole Energy's Richmond fueling depot. However, a prebuilt system that met company and project specifications came up for sale from Kinder Morgan at their Richmond fuel terminal. Two skids were purchased from Kinder Morgan and modified to blend biodiesel with diesel.

The system was originally meant to be installed at Whole Energy's Richmond biodiesel terminal. However, the initial site had insufficient electric power available at the terminal and a new site was identified in Watsonville at Northstar Biodiesel's facility. The skid-mounted blending system was shipped to their location and installed at one of Northstar's loading racks.

Figure 1: Biodiesel Blending Skid



Photo Credits: Whole Energy Fuels

CHAPTER 2:

Project Installation

Activities Preformed

The activities preformed where the following:

- Whole Energy specified the needed flow rates and materials compatibility for the biodiesel blending equipment.
- The project team located used equipment that could meet the project's specifications and achieve the project's goals.
- The equipment was purchased and shipped to the Watsonville location for installation.
- The equipment was retrofitted to ensure that it could operate in the desired blending function and meet materials compatibility requirements.
- The equipment was installed and tested.
- The equipment was put into service at the end of April 2015.

Figure 2: Installed Blending Skid



Photo Credit: Whole Energy Fuels

Data Collection

Between April and September of 2015, 68,498 gallons of biodiesel were blended at the B5 (5 percent blend) and B20 (20 percent blend) levels. The new blending equipment enables efficient metered blending of Northstar Biodiesel's biodiesel with diesel fuel.

This blending operation serves a variety of customers in Santa Clara, San Benito, Santa Cruz and Monterey Counties. Customers include government agencies, Cal Trans, local School Districts, private fleet operators and local farmers. The new biodiesel blends are being sold at 10 gas stations.