Green Action Fund Project Proposal

Waste Vegetable Oil Dryer

*Project Proposer:* Devon Ronsse (Pick-up Lead), Rachel DeMyers (President), Allison Clark (Vice President), Adam Lappe (Distillation Researcher)

*Project Supervisors:* Edwin Brokesh (Biological Agricultural Engineering Instructor), Daniel Higgins (Professor of Chemistry), Bill Spiegel (Recycle Center Facilitator)

*Collaborating Student Group:* Kansas State University Biodiesel Initiative

### Introduction

The conversion of waste vegetable oil (WVO) to usable biodiesel stands as an effective method to maximize the potential of the WVO produced during food preparation. The process takes in a useless byproduct and turns out a valuable green commodity. As a student run organization, the Kansas State University Biodiesel Initiative collects used vegetable oil from on-campus dining centers and manufactures biodiesel to be supplied to the recycling facility for use in university vehicles.
A limiting factor in the biodiesel production process exists in the quality range of WVO which can be processed. If collected WVO possesses high water content, the oil must be heated before being processed to evaporate excess water. The heating process is currently conducted inside our BioPro 190 Reactor, often slowing the manufacturing process by time periods between 1-7 days. Having sufficient funds to acquire a WVO heating unit separate from our reactor enables us to both generate useable fuel while simultaneously preparing our next batch. This will allow for a streamlining of our manufacturing process, significantly increasing our production capacity.

**Forms and Amounts of Direct Student Involvement**

The Kansas State University Biodiesel Initiative is a student organized and operated manufacturing process. Students involved in the organization will be directly responsible for researching and acquiring the necessary items for the WVO heating unit’s production and working with project supervisors to arrange the unit’s assembly. As the unit is integrated into the existing manufacturing process, students will be responsible for unit operation and upkeep.

A student will keep record of the number of days the WVO heating unit is in operation during the spring semester to measure the increase in production capacity generated by the unit. Our BioPro 190 Reactor is capable of producing a fifty gallon batch of biodiesel once every 3-4 days. By comparing the number of days the WVO heating unit is in operation to the time frame necessary to complete a reaction, we can directly track our increase in maximum production capacity. Additional water testing will be conducted by a student researcher on collected WVO to further analyze the water content in feedstock oil. A report will be prepared using this data to generate a statistical analysis of water content from each collection point with the goal of recognizing trends to maximize efficiency in the production process.

**Sustainability/Environmental Benefits to the University**

All biodiesel produced by our organization is supplied to the Recycling Center for use in their vehicles. The biodiesel we produce directly reduces conventional diesel consumption of campus vehicles. Our goal as an organization is to produce fifty gallons of biodiesel per week. Usage of sustainable fuels on campus is tied directly to the amount of biodiesel our organization produces. As our production capacity is raised, conventional energy consumption decreases: the result being a measurably more sustainable campus.
Benefits to the K-State Student Body

Kanas State University currently supports over 475 student organizations. The wide variety of opportunities available to students aids in the creation of an atmosphere which promotes personal and professional development. The Kansas State Biodiesel Initiative offers a unique opportunity for students to learn and apply the principles necessary to successfully operate a manufacturing process. As the organization’s ceiling for capacity rises, we will experience an increasing need to continue to grow club membership. Our organization currently comprises of 20 active members. Membership growth, a direct result of an increase in production capacity, will be tracked to demonstrate that our organization is in a state of constant evolution and recruiting to positively affect as many members of the K-State community as possible.

Detailed Budget

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Timeline of Activities

• **January** – Begin to investigate the materials and equipment required to make a WVO heating unit viable as well as make contact with manufacturers who sell that equipment.

• **February** – Conduct further research into necessary WVO heating unit components and assembly process. Acquire necessary components for WVO heating unit assembly.

• **March** – Assemble WVO heating unit and integrate unit into existing manufacturing process. Educate current biodiesel initiative members on WVO heating unit operation and upkeep.

• **April/May** – Track water content of incoming WVO oil and analyze effects of the heating unit on Biodiesel Initiative production and recruiting capacity.

• **June** – Prepare a report based off of collected data to demonstrate organizational progress during spring semester.

Future Expansion

Following project completion, our organization will continue to develop and grow. We plan to expand our feedstock oil collection to restaurants around Manhattan, growing our incoming flow of WVO. Additionally, we are working currently to integrate a distillation column into our manufacturing process. Following integration, this column will allow for the conversion of byproducts of the biodiesel production process to be converted into usable soaps. We plan to conduct research into the possibility of marketing these soaps as a separate product, further increasing the economic viability of our manufacturing process. The future of the Biodiesel Initiative holds significant opportunity for expansion of our existing operations.

Project Administration

The project will be supervised by Edwin Brokesh through the Biological and Agricultural Engineering Department. A statement of support from the department is attached.