**Abstract**

The San Francisco Agricultural School in the Chaco region of Paraguay is a boarding school that is looking to reduce its current expenses on a steam boiler. Currently, the boiler is fueled by costly wood, which is becoming a financial burden for the school. Our objective is to relieve the economic and environmental burden of wood burning by creating a concept design of a boiler system that uses an alternative energy source. A system using a liquid fuel burner powered by biodiesel would be a solution that meets and even exceeds the school’s standard for cost-effectiveness and sustainability. To implement this idea, we have put together a manual with illustrations and simple instructions translated to Spanish so that even someone with little to no technical experience or knowledge could adopt, operate and maintain the biodiesel-powered heating system at the School.

**Background**

- The San Francisco Agricultural School uses a boiler to produce products such as yogurt and cheese. These products are sold to local grocery stores. Profits made from the sales are used to fund the school.
- The current boiler is powered by burning wood.

**Current Problems**

- The school spends $400/month on wood.
- The school does not have the resources or budget to implement high cost and high tech solutions.
- Wood smoke emits carcinogens, which are harmful to humans to breathe in.
- Large amounts of CO$_2$ are emitted when wood is burned.

**Project Goals**

- Design a more economical and environmentally friendly boiler.
- Use waste vegetable oil to produce heat for the boiler at the school.

**Step 1:** Vegetable oil $\rightarrow$ Biodiesel

**Step 2:** Pressurize Fuel

**Step 3:** Heat and Atomize Fuel

**Step 4:** Create steam for yogurt/cheese production

**Benefits**

- The school will spend less on fuel as vegetable oil can be collected from the school’s cafeteria and local restaurants such as McDonald’s.
- Biodiesel does not emit carcinogens or other toxic substances found in wood smoke into the environment.
- Components of the model are readily available at local stores in Paraguay.

**Selection of vegetable oil**

- rapeseed oil
- sunflower oil
- recycled frying oil
- diesel fuel

**Greenhouse Gas Emissions [g CO$_2$/PKW-km]**

- The translated manual will enable students at the school to implement the idea themselves.
- The school will be more self-sufficient as it will be able to produce yogurt and cheese at a lower operating cost.
- The model can be adopted by other organizations to promote the use of non-renewable sources of energy.

**Selected References**


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