

Goals and Motivation

In São Paulo, Brazil *catadores*, or wastepickers, work in co-operatives to collect, sort, and resell the city's recyclable trash. Some of these cooperatives also collect waste vegetable oil (WVO) but rarely utilize it to its potential.

The *catadores* are among the poorest people in the city. They must support their families on an income of under \$7 each day. One of the cooperatives spends around \$2,750 on diesel fuel each month, totaling to 20% of the operational costs. This project proposes a way to help the cooperatives reduce operation costs and increase revenue by:



Catadores collecting recyclables
Photo courtesy of Libby McDonald

- developing an entrepreneurial opportunity by converting customers' diesel engines to run off WVO
- using WVO to fuel the cooperative's vehicles and thereby eliminating fuel costs

Implementation Plan

Workshops for the *catadores*:

The local *catadores* union, RedeCatasampa, is our local partner and will be assisting us with the organization and planning of these workshops. The workshops will teach the *catadores* how to properly filter the WVO and how to convert diesel vehicles to run off of the straight vegetable oil.



A cooperative of catadores sorting waste
Photo courtesy of Libby McDonald

Students would remain working with the cooperatives for a few weeks to insure that *catadores* fully understand both processes. They would also develop set of training guidelines and handouts that could be distributed to everyone who had attended the workshop. It is

our hope that the *catadores* who learned this skill from us would then teach others within Sao Paulo, and could eventually market this skill to the public as a means of generating income.

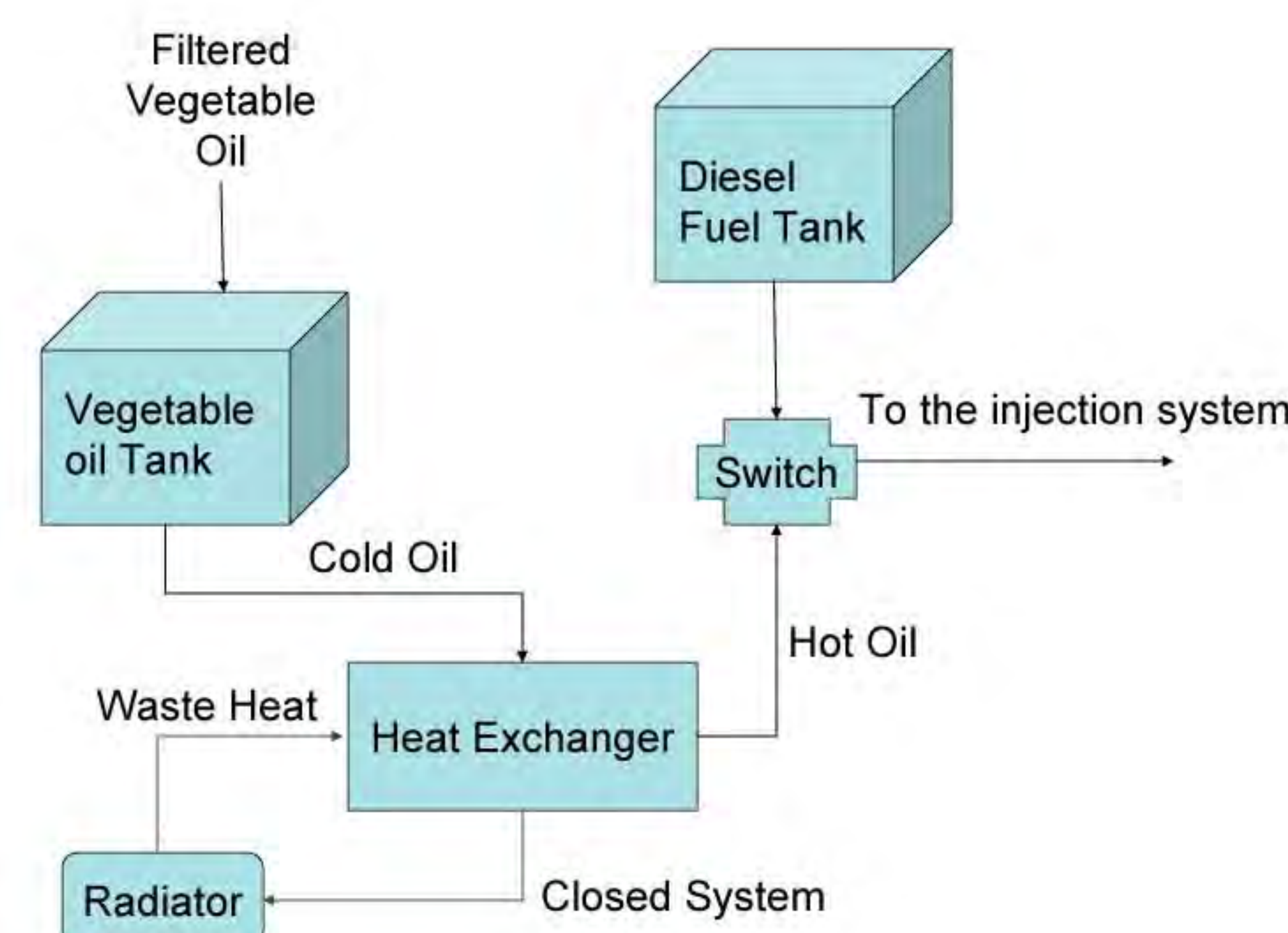
Also, after the MIT students leave, *catadores* will receive ongoing assistance from our Local Partners, specially RedeCatasampa and FGV, the local School of Business.

Technical Aspects

The cooperative will begin by converting the trucks that they operate to run on WVO so that they can reduce their spending on diesel fuel.

Converting a diesel engine to run on WVO:

- The vehicle must start and stop on diesel fuel
- The engine needs to be warmed up and vegetable oil needs to be heated before it can be used
 - The SVO in the tank needs to be heated to at least 160°F before it becomes viscous enough both to be pumped to engine and to burn with similar efficiency as diesel.
- Heating can be done by recycling heat from the engine coolant line or by a heat exchanger
 - Avoid rubber fuel lines: SVO is a strong solvent and will dissolve rubber over time.
 - Synthetic fuel lines like polyethylene or metal fuel lines (that are not copper-based) are both reliable and easy to find.



The image above shows that waste vegetable oil is passed through a filter prior to being put into the vehicle. The oil is heated through a heat exchanging process using waste heat from the radiator. The switch controls which type of fuel is being used.

Challenges

Technical:

- Adequately conveying and maintaining the engine conversion knowledge
- Ensuring proper oil collection and filtration so that the quality is good enough to avoid damage to engines
- Adapting known engine conversion techniques used in the United States to methods that will be easier to implement in Sao Paulo
- Making sure that the *catadores* understand how to maintain the engines over time since the engines may be prone to problems if they always run on vegetable oil



Current storage of WVO at a cooperative
Photo courtesy of Libby McDonald

Social:

- Training program may be difficult because many of the *catadores* are illiterate
- Maintaining a support structure, and developing a champion of this program on the ground
- Ensuring that people in the community trust the work of the *catadores* so that they can build a client base

Conclusion and Future Work

The next step of this project will be converting other engines. There is the potential to generate income for the *catadores* by creating a business. The goal of our project is to create a network where it will be simple enough to acquire parts and teach other *catadores*, and inexpensive to make the project viable in other developing countries. Once the *catadores* learn how to convert engines, we can help them create a business to do this for other people and to provide the oil to run them. Since these problems are applicable to other cities, this project has the potential to reduce waste and create income in other places. During a time where self-sustainability is desired, this project illustrates an energy efficient way to reduce costs and help the environment.