2007 Waste Bio-oil Supply Survey

Government of Yukon - Energy Solutions Centre in Partnership with
The City of Whitehorse and the Yukon Conservation Society

Final Report

December 27, 2007

energy solutions centre

THE CITY OF WHITEHORSE 19 50

Yukon Conservation Society

PROJECT OVERVIEW

Many vegetable/animal sourced oils, typically used for cooking, have similar energy properties to fossil fuels and are being used throughout the world to supplement conventional petroleum-based fuel sources. The benefits of using these sources to displace conventional fuels include: reduced air pollution, reduced greenhouse gas emissions, waste management, and conservation of non-renewable energy. The more promising uses for these renewable "bio-oils" are in both transportation and heating where limited alternatives to petroleum fuels exist at this time.

Restaurants and other cooking facilities regularly dispose of significant amounts of waste cooking oils making this waste product a particularly attractive option for use as a fuel.

In order to evaluate the potential for this resource as an energy feedstock in the Yukon, the Yukon Government's Energy Solutions Centre (ESC), and the City of Whitehorse funded a study of the available waste oil supply within the City of Whitehorse. This study was conducted by the Yukon Conservation Society (YCS) with technical support provided from both ESC and the City of Whitehorse.

This survey was undertaken throughout the late summer and fall of 2007 and included surveying any and all potential sources of waste bio-oils along with any individual or business presently involved in using waste bio-oils for energy.

Through this study YCS was able to identify 63 restaurants and other facilities, in the Whitehorse area, that may produce significant quantities of used cooking oil or other appropriate biofuels feedstock. These facilities include restaurants, senior's residences, the hospital, cafeterias and a local fish hatchery. The principal goal of this project is to develop an accurate assessment of the quantity of potential feedstock for bio-fuels in the Whitehorse area.

This study included the following steps:

1. Conduct research on the factors that impact the quality of used oils for use as a fuel source.
2. Develop a survey, in conjunction with the City of Whitehorse and the Energy Solutions Centre that explains the purpose of this research, and asks how much waste bio-oil a restaurant or facility produces, how the quantities vary depending on time of year, how it is currently stored and disposed of, and how often it is disposed.
3. Phone calls and visits to managers of the restaurants and facilities to explain the study and ask them to participate.
4. Distribution of the survey electronically and as hard copies.
5. Follow up with managers of restaurants and facilities regarding the survey.
6. Collection of completed surveys and entering of the response data into a spreadsheet.
7. Production of a brief report summarizing the survey's findings.

PROJECT BUDGET

This program incurred the following costs:

- Initial research and reporting on biofuel sources and availability: $1200
- Preparation and distribution of a survey: $3600
- Collection and analysis of survey results: $1564
- Administration and project management costs: $636
- **Total cost: $7000**

Budget Sources:

ESC Contribution	$3,500
City of Whitehorse Contribution	$3,500
Total	**$7,000**

PROJECT RESULTS

Within the Whitehorse area, YCS identified 63 likely sources of bio-oil to be surveyed. Of the 63 facilities the survey was completed by 52 facilities giving the survey a completion rate of 83%. The quality of the answers provided by the participants varied, however the high participation rate makes the result an excellent assessment of the current bio-oil feedstock availability in the City. Several key results follow.

Oil Types:

The types of oil used in restaurants are primarily: non-hydrogenated canola vegetable oil, hydrogenated canola vegetable oil and animal lard or fat. The more hydrogenated or hard and condensed the waste oil is, the quicker it is to harden in cooler temperatures therefore making it less appropriate as a source of biofuel in the north. Animal lard is not ideal for use as a biofuel however it can be used in some applications.

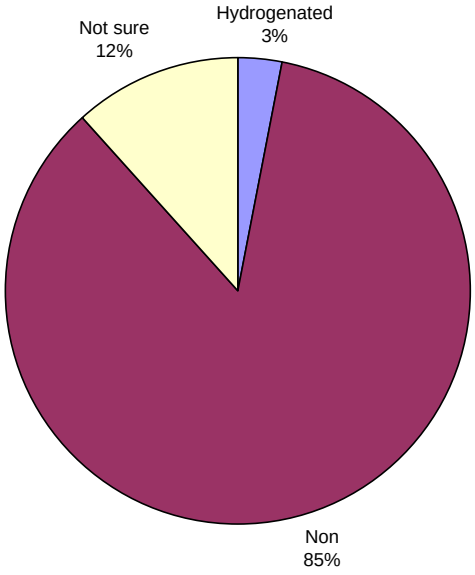

Figure 1a

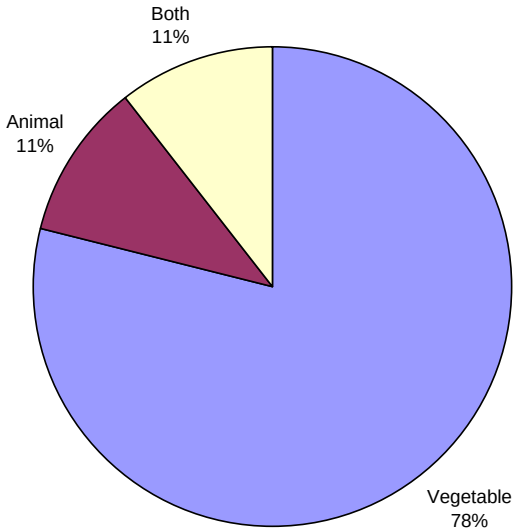

Figure 1b

Figures 1a and 1b: Types of Bio-oils used based on number of Facilities (1a. Hydrogenated vs. no Hydrogenated vegetable oil; 1b. animal vs. vegetable oil)

Oil Quality:

The quality of the waste bio-oil will determine how easily it can be used for biofuel. Lower quality oils (oils that contain contaminants more difficult to filter out such as water or cleaning products) can be converted into biodiesel, however these oils require more complex processing and the end product is a much lower quality fuel. Common contaminants in waste oils include: food debris, hard waste, cigarette butts, cleaning agents, chemicals, other liquid waste, and water.

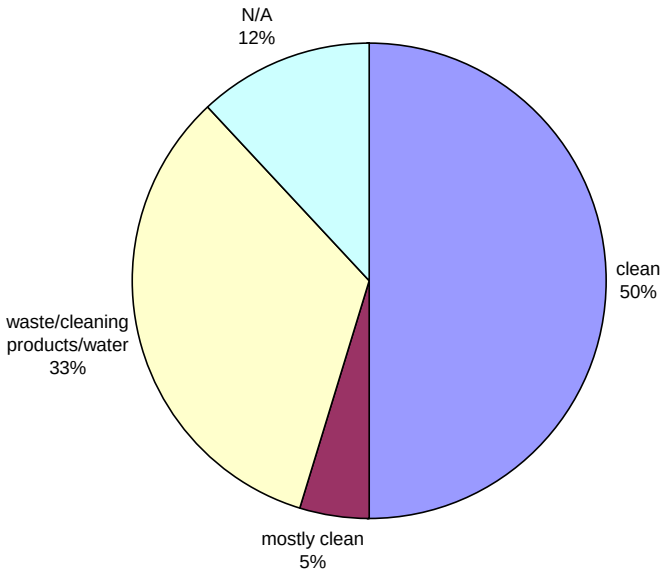

Figure 2: Percentage of facilities with likely contaminated waste oils

Total Bio-oil Available and Present Use:

This study was able to determine an estimated **total waste oil potential of approximately 5,850 litres/month**. Of this total approximately **2,500 litres/month** is currently being used for biofuel products while approximately **3,350 litres/month** are going to landfill.

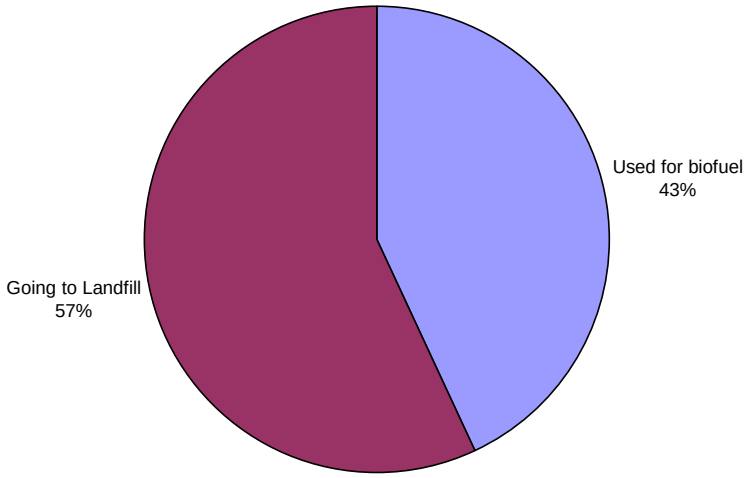

Figure 3: Estimated Percentage of waste Bio-oil presently being used for Biofuels

Biofuel Production in the Yukon:

As is evident by figure 3 above, over the course of conducting this survey YCS was able to identify a significant amount of waste oil as already being used to produce biofuels. Along with potential bio-oil source facilities two of these biofuel producers where interviewed for the purposes of this study.

One of the biofuels producers interviewed for this project was by far the largest operation in Yukon. Based on numbers the company provided it is estimated that the operation uses approximately 38% of the estimated total waste oil presently available in the Whitehorse area for their biodiesel manufacturing operation. They have been collecting waste bio-oil for over a year and a half and have kept detailed records of their collection from each restaurant. They were able to review the survey results and advise the surveyors regarding the accuracy of the information provided by restaurants in our survey.

CONCLUSION

There exists a waste bio-oil resource in the Whitehorse area that can be, and is being used to supplement energy use in the territory. The benefits of using this resource as a source of energy are many and include: reduced air pollution, reduced greenhouse gas emissions, waste management, and conservation of limited fossil fuels.

With approximately 50% of local bio-oil source facilities producing a high quality, non-contaminated waste oil and approximately 43% of all waste bio-oil already being used to produce biofuel; this survey has shown that, not only is there a waste resource in Whitehorse but that the bulk of the high quality resource is already being used for biofuel production.

This project gives context to the scale of this potential resource along with offering insight into next steps that may be taken to facilitate increased biofuel production in the future. From reviewing the results of this survey it is clear that future efforts to promote the use of this resource should be focused on increasing the quality and availability of the remaining 50% of low to medium quality bio-oil that is presently going to landfill. It may be possible to encourage simple changes in storage and disposal that would significantly increase the quality of this feedstock and thus increase biofuel production and availability while decreasing waste to landfill.