

Comparative Study of Smaller-Scale Biodiesel Co-ops¹

By Michelle Freundt

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1. Selecting Cases for Study

We set out to study four co-ops that had the greatest relevance to the EverPure project as we have developed it thus far and envision its development from here on. For our purposes, two criteria were paramount: a) our cases needed to be small-scale co-ops with low capital start-up costs, hence readily replicable, so that a local co-op of farmers and consumers could be formed to own and manage the operation, delivering benefits to its members. b) from the standpoint of the founding organizations, Everdale and PURE, the co-ops had to have exemplary environmental practices. It was essential that they use ‘waste’ oils (by-products of food production) for feedstocks.

We found three co-ops that fit our criteria but none were in our ‘home jurisdiction’ of Ontario. So we added a small family business in Owen Sound because of its impressive proficiency in smaller-scale biodiesel production, the owner-operator’s willingness to work with us as an initial fuel supplier for EverPure, and more immediately, his assistance in supplying information for this study.

Selected Cases

¹ This study was conducted for EverPure by Michelle Freundt with the generous support of the Agricultural Co-op Initiative of the federal government’s Cooperatives Secretariat. She very much appreciates the support, encouragement and expertise of the founding partners; in particular, Richard Proctor and Tony Howard of PURE and Jay Mowat and Wally Seccombe of Everdale Environmental Learning Centre.

Piedmont Biofuels, Inc.
P.O. Box 661,
Pittsboro, NC 27312 |
Incorporated 2003
www.biofuels.coop
Dr. Lyle Estill
lyle@blast.com
919-321-8260

Vancouver Biodiesel Co-operative
360 Industrial Avenue
Vancouver, British Columbia
Incorporated Sept. 2005
www.vancouverbiodiesel.org
Louise Schwarz
ralouise@telus.net
604-874-7283

Island Biodiesel Co-op
British Columbia
Incorporated Nov. 2006
Karel Rossesingh
karel@roessong.com
250-727-9808

Lougheed's Biodiesel
P.O.Box 939, Owen Sound,
Ontario, N4K 6H6
<http://users.sitewaves.com/lougheed>
Greg Lougheed
lougheedfisherieslimited@hotmail.com
519-376-1586

2. Research Methods

In preparation, we looked carefully at a number of relevant studies. The one we found most helpful was the 'Biodiesel in British Columbia Feasibility Study Report' (http://www.wd.gc.ca/rpts/research/biodiesel/full_e.pdf , posted on the Ag –CDI Wiki website at http://www.advantage.coop/agcdi/index.php/Main_Page). We found it to be an accessible and thorough primer that deepened our understanding of a number of keys to success in setting up smaller-scale biodiesel businesses. With Ag-CDI's generous support, three of us attended the conference in Ottawa that furthered our understanding, put us in contact with knowledgeable peers, and, as the smallest producer at the conference, forced us to think through the advantages of smaller-scale production volumes reflecting them in our inquiry below. We then drafted a thematically-guided format for telephone interviews that was designed to generate reasonably uniform information from the four sets of informants in key areas, enabling us to compare their co-ops along these lines.

Having finalized our choices, we sent each an introductory email requesting participation in the survey. They were all willing to participate, demonstrating, once again, the spirit of open-source knowledge-sharing, for free, (in this case with a person they have never met) that is a hallmark of the web-wired network of smaller-scale pioneers that has emerged and continues to expand across North America. Our sincere thanks to Lyle Estill and Leif Forer of Piedmont Biofuels, Inc., Louise Schwarz of Vancouver Biodiesel Co-operative, Karel Rossesingh, Terry Halverson and Don Goodeve of Island Biodiesel Co-op and Greg Lougheed of Lougheed's Biodiesel. Thank you all for your co-operation, time and patience!

When each one agreed to answer our survey, we gleaned as much information as possible from the co-ops' websites so as to avoid taking up their time addressing questions for which they had already supplied answers in the public domain. As EverPure's designated researcher for this project, Michelle Fruendt conducted the interviews by means of email and telephone according to the participants' preferences.

For the sake of comparison, results have been entered onto a spreadsheet and brief comments supplying additional information have been inserted where needed. Discussion of some issues not adequately captured in the spreadsheet are then elaborated beneath it.

3. Brief Sketches of Selected Cases

Piedmont Biofuels, Inc. is the oldest and most well-established of the co-ops in our study. It is, quite possibly, the most sophisticated of smaller-scale co-ops in the United States. Its basic nature -- combining a breezy style, a pioneering can-do ethos, with technical depth and sustained attention to scientific research and testing protocols -- is well captured through an examination of their website, and also comes across in the book, *Biodiesel Power*, authored by Piedmont's cofounder Lyle Estill. I began my interviews with him. As with the other producers surveyed here, Lyle began experimenting with biodiesel "1 litre at a time" using a second-hand blender and consulting Joshua Tickell's self-published book, *From the Fryer to the Fuel Tank*, as legions of American 'backyarders' have done before him. Shortly after, he took a new course offered at Central Carolina Community College and developed important relationships with the instructors, Rachel Burton and Leif Forer, who joined Lyle in founding Piedmont Biofuels with the support of the College. Formed in 2002 and incorporating the next year, Piedmont has grown rapidly, from 25 members at the beginning of 2005 to over 200 members by year's end. An industrial plant and retail stations are presently being built. We are taking Piedmont's 2005 year as our point of reference (prior to the development of the industrial, continuous-process plant) because it reflects an ideal destination for the smaller-scale co-op that EverPure hopes to become.

Vancouver Biodiesel Co-operative, winner of the 2006 British Columbia Co-operative Association Distinguished Cooperator Award, was founded by EcoFuels Canada Inc. (www.ecofuels.ca) to supply biodiesel to individuals and small businesses at competitive rates. Louise Schwarz, co-founder and owner of Recycling Alternative, provides the vehicles and drivers to pick up B100 from West Coast Reduction (an animal rendering plant) and return it to the Recycling Alternatives yard, where it is stored in a 2,000 litre locked tank and distributed to members without an attendant. Members with prepaid credit, have a key that unlocks the tank; they fill up and log their use in a book which is then tracked by the staff of Recycling Alternatives. [*this sentence unclear: Over time, compensation for such contributions will be built into the co-op model.*]

In the fledgling **Island Biodiesel Co-op**, the six member-producers are called brewers. All are making biodiesel from their own self-built reactors. Beyond their own use, the surplus is made available to a second class of consumers (though interestingly, the producer-consumer distinction is not recognized in their articles of incorporation). Because local demand for biodiesel far exceeds the surplus the 'brewers' are able to supply, the co-op is forced to adopt a rationing system, and it does so by setting a maximum amount per consumer-member of 54 litres and making this amount available on a rotating basis, using 18 litre containers. This model is very relevant for EverPure in our second phase, since we have two small reactors housed at Everdale, and that model can be supplied at a reasonable cost by the technician Joseph Street. As EverPure becomes proficient in producing quality fuel in those reactors, several farmer-members, oilseed suppliers, may wish to acquire reactors and set up as producers who sell fuel to the co-op above and beyond their farm's needs.

Lougheed's Biodiesel. Greg Lougheed, who owns a fish-plant in Owen Sound took up bio-diesel transesterification on a scale three years ago. He embarked on an ambitious self-directed course of 'basic chemistry' research, web-based learning from the best of the 'backyarders' such as Lyle Estill, trials, external testing, and learning how to become proficient in making quality biodiesel from a variety of (used) feedstocks. His facility is an excellent example of smaller-scale production in Ontario. Michelle Fruendt and Jay Mowat visited Greg's plant in person and he spent time patiently answering their questions. Although plans for a Lougheed/Canola Growers co-op are premature for the purposes of this study, Greg's extensive experience, expertise and willingness to provide technical consultation are invaluable for our purposes. The fact that he has achieved so much (including selling to the public) in Ontario, in our regulatory jurisdiction, adds a layer of relevance to the Lougheed case study. Greg has placed a retail pump outside the plant and delivers B100 to homes in the Owen Sound area for heating. The blend he supplies at the pump is adjusted according to the season. A license is required to transport blends, which Greg has applied for.

Note: EverPure in 3 stages: Initially, EverPure plans to buy B100 from Lougheed to distribute to our members until the fuel we are now producing in trial-batches at Everdale is properly tested and ready for general use. Then, in a second stage, we will increase the volume being produced at Everdale and perhaps at other sites as well, until we can generate the volume needed to meet our members' demands. The fuel we make will be distributed to the co-op's farmer-suppliers in the first instance, and secondly to its consumer members, beginning with PURE's members in the Orangeville area. Finally, in a third stage, EverPure will 'close the loop', with local farmer members supplying oilseed for crushing into virgin oil, rented to local restaurants, and taken back after their use to make into biodiesel. As soon as the owners and managers of restaurants are substantially involved, we plan to invite them to become members, rounding out a 3-class membership structure.

4. Comparative Survey - Attached

5. Discussion of Specific Features

Co-operative Structure

Formation

The producer co-ops, Island and Piedmont, started small, with pioneering producers making fuel for their own vehicles and furnaces. The initial demonstration of proficiency was achieved in this fashion, and as others became interested, they conducted tests for fuel quality. With many neighbours keen to switch, the logical step was to form co-ops and sell to members. Typically, member demand has exceeded supply. The challenge has been to increase production capacity to keep up. The alternative to raising production capacity is to cap the membership, or develop a rationing system, limiting the number of litres that any member can purchase in a month.

Producer/Consumer Arrangements

At Island Biodiesel, producer/consumer co-op, the 6 producer members 'brew' in their own reactors for their own needs and sell their surplus to the consumer members. This is a temporary measure, as the current arrangement provides an irregular supply to consumers and puts pressure on the 'brewers' to raise their output volumes. Farmers, in particular, have expressed an interest in hosting a much larger facility; this is now on the Island Co-op's agenda.

Piedmont is a worker/consumer co-op. The worker members pay the \$50USD annual membership fee and commit to working 5 hours a week, which may involve anything from making fuel (once properly trained) to working on their website. This labour contribution entitles working members to the Do It Yourself price of \$1.50 USD/gallon (\$0.47CAD/litre), road tax included. Members who do not work pay more than twice as much, \$3.50USD/gallon (\$1.07CAD/litre).² Piedmont buys fuel from commercial biodiesel manufacturers for distribution to its consumer members, reaping a small return.

Starting a Co-op: Legal Steps and Documentation

I judged it to be of limited value to gather extensive legal documents of incorporation for co-ops not based in Ontario and subject to the laws and regulations of other jurisdictions. EverPure aims to become a co-op in Ontario. Most helpful, for our purposes, is the Co-operatives Secretariat link

http://coop.gc.ca/index_e.php?s1=guides&s2=kit&page=intro.

² Currency conversion as of April 2007.

Production Issues

Catalysts

Known under the general term Lye, Potassium Hydroxide (KOH) or Sodium Hydroxide (NaOH), also known as caustic soda, are used with methanol.

(<http://en.wikipedia.org/wiki/Methanol>).

According to www.journeytoforever.org, which provides complete details, NaOH is superior for titration purposes and KOH as the actual catalyst. The pros and cons of these catalysts are also discussed in the B.C. feasibility study cited above. Piedmont's Member Handbook (attached) includes well laid out, step by step worksheets with all necessary calculations to be followed while processing.

Cost of Catalysts

Potassium Hydroxide (KOH) is \$1.80/kg and hasn't changed in 3 years.

Sodium Hydroxide (NaOH) is about \$1.30/kg.

Methanol Sources

Detailed purchaser information must be provided to the supplier by law. Because of its toxicity, records regarding the identity of the buyer and intended use must be maintained. Methanol and Lye are available through several types of distributors, as they are sold for many uses. Allan Hodder has been making biodiesel for his family's personal and farm vehicles in Burks Falls, Ontario for 5 years. He uses Ashland in Mississauga as his supplier. (1-800-ASHLAND).

Methanol Costs

Methanol is made from natural gas and the price fluctuates with the price of natural gas. Today's quote by Ashland is 95 cents/kg. (\$174.45 incl. taxes for a 162kg drum). Free shipping for orders over \$750.00. \$65 refundable deposit per drum.

The Challenge of Quality Control and External Testing

Clearly, in batch production, where quality may vary from batch to batch, testing many batches in a sequence can quickly become prohibitively expensive. A typical biodiesel (B100) ASTM D6751 test costs \$1400 for the purposes of certification. Smaller-scale producers generally handle this challenge by settling on a known feedstock, ensuring its uniformity on key variables (free fatty acid levels), conducting the transesterification process the same way each time, carefully monitoring key variables, and getting tests done each time a new feedstock is introduced or the manufacturing process is modified significantly. A university research connection (complete with graduate students in chemical engineering) can be very useful in providing technical expertise and keeping costs down. EverPure intends to establish such a relationship.

Reimbursement for test costs may be available from government sources, federal and provincial, to be included in the startup costs of biofuel projects that obtain funding

support. Here too, EverPure plans to remain proactive. In the case of the Alberta Research Council, Fuels & Lubricants Group, the test cost is reduced by 70% to \$420 for the first application. The second application test cost is reduced by 50%. Additional applications are reduced by 30%.³

Safe Handling & Storage

While all groups have rules for safe handling & storage, Piedmont's guidelines are the easiest to access on their website in the Member Handbook. The following link to a Methanol Monograph http://www.cqconcepts.com/chem_methanol.php provides us with detailed information needed to develop EverPure's own guidelines.

6. Issues Needing Further Study

a) Best uses of by-products: recovery of methanol and glycerin. b) Waste water disposal. c) Tax and licensing regulations; d) Liability issues: waivers, insurance, and understanding co-op law re honest dealing among members; e) at what stage should we pool feedstock? Should we gather oilseed for joint crushing, or should each contributing farmer supply his/her own oil by taking some back from own processing?

7. In Conclusion: Demonstrating the Advantages of Smaller Scale

The phrase "economy of scale" is normally taken to imply that bigger is better, that the larger one's production capacity, the lower the unit costs will be, all else being equal. The co-ops we studied show that this is not necessarily true for bio-diesel. Smaller-scale production and distribution networks can work well for the following reasons.

In the first place, the barrier to entry is much lower. The equipment and facilities needed for small-scale batch production cost a fraction of the big plants running continuously. For most farmers, who have suffered depressed net farm incomes for several years in a row, with many deeply in debt, the upfront capital costs of becoming shareholders in a larger co-op venture is prohibitive. The building of small-scale operations allows them to take an ownership stake in a local facility and collectively control inputs, outputs and the production process in their own interests. This is a refreshing change from the dismal pattern that has become the norm for new "innovative" products in the agri-food industry. Typically, farmers come to rely on new inputs (seeds, fertilizers and machinery, etc.) purchased from big companies while selling new farm products to major processing firms. Surrounded by well-capitalized firms they do not own or control, farmers lack market power. While their costs rise, the prices they receive for standard agricultural commodities decline, resulting in a brutal squeeze on net farm income. As value 'migrates' up an ever-lengthening supply chain, farmers are unable to realize their productivity gains on the bottom line.

³ Deni Sarnelli, Alberta Research Council, Fuels & Lubricants Group, 250 Karl Clark Road, Edmonton, Alberta, Canada T6N 1E4
<http://www.arc.ab.ca/Index.aspx/ARC/397>

A smaller-scale biodiesel production unit enables local farmers to break this pattern for a new product, reducing their reliance on purchased fuel by recovering a used food product and converting it to fuel, while not having to forego any revenues from the sale of oilseed. In this way, they gain control of an important operating cost that is otherwise subject to increasingly volatile price fluctuations on the world market. As these co-ops demonstrate, a local co-op with reasonably efficient production methods can sell quality biofuel to its members at a price per litre that is the same, or slightly less, than petrodiesel prices in today's retail market. The big difference is that the co-ops can deliver fuel at a predictable and steady price. By controlling their own inputs and operating costs, these co-ops are not subject to the radical price swings exhibited in world oil markets. Whenever fuel prices represent a significant portion of a farm or small business's operating costs, this price steadiness and predictability makes it much easier to develop a realistic farm business plan and stick to it.

Despite higher unit labour costs and quality-control challenges, small-scale operations can produce fuel at a similar price to larger operations by taking advantage of local sourcing for feedstocks. They can do so in a variety of ways; frequently, they obtain used cooking oils from local restaurants in volumes that are adequate to their needs. (This is the case for Island Co-op and Piedmont Biofuels in its early years.) Large plants, by contrast, find collecting from hundreds (or thousands) of small used-oil sites too costly and time-consuming.

Being able to tap the myriad of local sources for relatively small volumes of used oil gives smaller-scale biodiesel producers two substantial advantages: a) they avoid the competition between food and fuel that is looming as a major concern with most large-scale forms of biofuel production in North America (such as making ethanol from corn and biodiesel from virgin vegetable oil). Employing used cooking oils is far superior environmentally, since the feedstock already has had a food use, and farmland is not being diverted from the acreage needed to maintain the grain harvest volumes needed to feed the world's population for decades to come.

b) The double use of vegetable oil (or animal fat) is a major economic advantage as well, since it reduces the price of the feedstock. Farmers supplying the feedstock for diesel production have already made money from its normal food use at the going market price. EverPure plans to rent oil to restaurants. Most restaurants and small food processing plants presently pay a surcharge for the collection of their used oil; they will be pleased to have the biodiesel producer collect it for free. The fact that this form of recycling enables them to contribute to a pioneering green venture is a bonus that can then be used in promoting their restaurants. Under these circumstances, the feedstock can be obtained for the price of assessing and collecting it, far below the price of virgin oil that most of the large plants will be forced to pay, as the aggregate volume of biodiesel production in North America increases exponentially in the next two decades. Since, in larger operations, the cost of the feedstock is a major component of biodiesel's final price, the cheapening of this input is a considerable advantage for small-scale batch operations, offsetting their labour-intensive requirements and quality-control demands of batch production.

In small-scale co-ops whose members live in close proximity, interpersonal trust and accountability become crucial assets. This is especially important in the early years, when a co-op is flexibly groping towards a viable business model and is able to work out agreements in members' meetings before they are codified in by-laws and legal articles of incorporation that are more difficult to modify later on. As democratic grass-roots structures, the co-operative form of small business organization suits many farmers and consumers with a pioneering spirit who wish to become more environmentally-responsible and self-sufficient. A co-op that sells only to its own members and not to the public-at-large spreads risk among those willing to assume it with their eyes open. This eases the regulatory and insurance burdens of getting biodiesel production facilities up and running.

A final advantage is that smaller-scale biodiesel producers make their fuel available to consumers for use in their (diesel) vehicles **at blending ratios that the latter themselves determine**. This permits those who are keen to replace petroleum with an environmentally superior fuel with the opportunity to do so in a risk-reward equation that suits them. Consumers who purchase biodiesel from mainstream gas stations do not enjoy this opportunity. They are presented with miniscule blends (B 2-5%) controlled by the oil companies and doled out in their gas stations as a facet of their petroleum-dependent business strategies. The fuel options of the mass of consumers will therefore be determined by Big Oil until such time as conventional reserves are in terminal decline, rates of production can no longer meet rising demand, and the planet's climate is changed for the worse beyond our ability to cope peacefully. Clearly, we need a genuine environmental alternative, a petroleum displacement strategy that points the way beyond fossil fuels and drastically reduces our dependence on oil from the Persian Gulf.

4. Comparative Survey - Comparative Study of Smaller-Scale Biodiesel Co-operatives *(shaded cells > see Comments below)*

	B	C	D	E	F
3		Island Biodiesel Co-op	Piedmont Biofuels, Inc	Vancouver Biodiesel	Lougheed's Biodiesel
4		(IBC)	(PBI) 2005 snapshot	Co-operative (VBI)	(LB) (Commercial)
5		Co-operative Structure			
6	Formation	Pioneer Producers	Pioneer Producers	Recyclers,	Fish broker
7	Type of co-op	Producer/Consumer	Worker/Consumer	Consumer (Distribution only)	N/A
8	Number of members	16+	25 to 200 during 2005	Temporarily capped at 100	N/A
9	Incorporation date	November, 2006	2003	September, 2005	N/A
10	Membership Fee	\$100	\$50USD/annum	\$100	N/A
11	Number of Membership Classes	1	1	1	1
12	Documents of Incorporation	Yes	Yes	Yes	N/A
13	Institutional Affiliation(s)		Central Carolina Community College	West Coast Biodiesel	Georgian Biofuels Canada
14				Ecofuels Canada	Canadian Canola Growers
15				Recycling Alternative	Rothsay Rendering
16	Website	on Agenda	www.biofuels.coop	www.vancouverbiodiesel.org	users.sitewaves.com/lougheed
17		Biodiesel Production			
18	Feedstock	Waste Oil	Waste Oil	N/A	Waste Oil
19	Waste oil price	\$0.00	\$0.00	N/A	Nominal
20	Feedstock suppliers	Mostly Restaurants	Restaurants	N/A	Rothsay Rendering
21	Biodiesel producers	Producer Members	Worker Members	West Coast Biodiesel	Lougheed Employees
22	Number of producers	6	Many	1plant	1plant
23	Number of production sites	6	1	N/A	1
24	Producing since	2003	2002	N/A	2004
25	Reactor	Self-built	Self-built	N/A	Self-built
26	Volume litres/annually	Too early to know	20,000L	20,000L purchased	200,000L
27	Catalysts	Methanol/NaOH	Methanol, KOH	N/A	Methanol, KOH
28	Methanol Source	Sports car shop, Univar	Various	N/A	Not ascertained
29	Methanol Cost	\$250-\$300/drum (162kg)	Bulk purchase	N/A	Bulk purchase
30	Lye Cost	See 'features'	See 'features'	See 'features'	See 'features'
31	Quality Tests	Initially external, then internal	Initially external, then internal	West Coast Biodiesel	Initially External when new feedstock used

	B	C	D	E	F
32	External Testing Costs	See 'features'	Central Carolina Community College	N/A	See 'features'
33	Producer training	Internet, Books	3 hour Workshop, Member Handbook	N/A	Internet, Books
34	Safe Handling & Storage	Yes	Yes, Member Handbook	Yes	Yes
35	Distribution				
36	Sites	Multiple pick up sites	1 for 'home made', several for 'store -bought, also deliver	1	1 for blends, deliver B100
37	Blending	Done by Consumer Member	DIY'ers for 'home made', unknown for store-bought	Members blend in tank	By Lougheed's
38	Sell to public	No	2006	No	Yes
39	Business Model				
40	Revenues	Membership, fuel sales	Membership, fuel sales	Membership, fuel sales	Biodiesel sales
41	Selling price	\$0.85	\$0.47CADL DIY incl. road tax/\$1.07CAD store-bought	\$1.24L incl. gst	\$0.949L incl. gst for B25
42	Cost	about \$0.55	\$0.31CADL DIY/ Not revealed	\$1.20L incl. gst	\$0.55
43	Price in relation to market	Below	No market price for DIY/Retail is Above	Above	Below
44	Amount to Co-op as revenue	\$0.15	Not available	\$0.04L	
45	Payment	Cash, Credit or barter	Cash, Cheque, 10% of local economy currency	Prepayment system/\$100 at a time	
46	Taxation	See 'features'	See 'features'	See 'features'	See 'features'
47	Risks				
48	Waiver	Yes, to be legally vetted	Yes	Yes	Unnecessary, see Insurance
49	Insurance	Director's insurance pending	No	Status Unknown	SIS Insurance

Cell Comments

D7: Worker members make their own, pay for supplies and electricity used. Consumer members buy fuel purchased by co-op that they call 'store-bought'.

C8: Membership growing faster than production can accommodate.

E8: Capped until an additional 500L trailer tote can be acquired for filling site.

D12: Membership Agreement, which is on website, has been used verbatim by other biodiesel co-op startups. Amended March 25/07 and updated on website.

D13: Since its inception, Piedmont has been intimately connected with CCCC, which is nearby. This connection has facilitated grant processing, access to a lab and automotive bays, and opportunities to learn and to teach. www.cccc.edu

E13: Biodiesel supplier. www.wcrl.com/products/biodiesel/default.htm Sister company of West Coast Reduction (Rendering). www.wcrl.com Vancouver based, family owned and operated business with its roots extending back over seventy years to a time when its founder owned and operated a butcher shop. Now the largest independent renderer in Western Canada.

F13: Retail Division of Lougheed's.

E14: President of Ecofuels Canada, Robb Miller is cofounder of VBI. www.ecofuels.ca

F14: Potential Marketing Co-op Co-founder

E15: Owner, Louise Schwarz, is cofounder of VBI. Recycling Alternative is site of trailer tote where members fuel up. Also, provides driver and vehicles for biodiesel pick up at day's end. www.recyclingalternative.com

F15: One of Canada's largest renderers. www.rothsay.ca Division of Maple Leaf Foods. Sister company of Rothsay Biodiesel. www.rothsaybiodiesel

D16: Is such an extensive site, would benefit from search function.

E16: Site features a video and focuses on information required to become a member.

F18: Has used fish oil. Currently using mostly margarine discarded by processor through Rothsay.

C20: Have stumbled across an unexpected supply of organic waste oil from a spa that offers warm oil pour treatments, as well as a recently opened eatery that didn't have a waste oil disposal plan yet.

D20: i.e. any kind of eatery

F20: One of Canada's largest renderers. www.rothsay.ca Division of Maple Leaf Foods. Sister company of Rothsay Biodiesel. www.rothsaybiodiesel

D21: The worker members sign membership agreement, pay m'ship fee, commit to 5 hours a week. Could haul grease, make fuel, do carpentry, work on website.

Because their worker contribution can be seen as 'making their own fuel' they are able to put homemade fuel into their tanks and drive on road.

E21: Biodiesel supplier. www.wcrl.com/products/biodiesel/default.htm Sister company of West Coast Reduction (Rendering). www.wcrl.com Vancouver based, family owned and operated business with its roots extending back over seventy years to a time when its founder owned and operated a butcher shop. Now the largest independent renderer in Western Canada.

F25: Greg is also marketing his own self-built Reactor Systems. They produce 200,000L - 2 million litres annually .

C26: Production is currently inconsistent. One of the brewer's spends one day a week to produce 350L a week for his personal vehicle, home heating and courier business needs, and another day to brew 350L for the co-op. Not sustainable for him. The others are making Another brewer is making 15L at a time, 2 others 30L, 35L and 100L. Plans are on the agenda to build their own plant to provide a more consistent level of production.

C28: Univar Canada Ltd., Toronto Distribution Facility Phone: 416-740-5300 <http://www.univarcanada.com/distribution.htm>

C31: For internal: www.journeytoforever.org

D31: In Member Handbook & Biodiesel Testing on website

E31: Biodiesel supplier. www.wcrl.com/products/biodiesel/default.htm Sister company of West Coast Reduction (Rendering). www.wcrl.com

Vancouver based, family owned and operated business with its roots extending back over seventy years to a time when its founder owned and operated a butcher shop. Now the largest independent renderer in Western Canada.

D32: Since its inception, Piedmont has been intimately connected with CCCC, which is nearby. This connection has facilitated grant processing, access to a lab and automotive bays, and opportunities to learn and to teach. www.cccc.edu

C33: www.journeytoforever.org From the Fryer to the Fuel Tank by Joshua Tickell

D33: Member Handbook on website

D34: On website

C36: Pick up arranged by individual producers & consumers

E37: Members pump diesel at commercial station then top up with biodiesel at co-op

B38: According to Canadian Co-op regulations, up to 50% of co-op product can be sold to public.

F40: Retail biodiesel sales for vehicles at pump, delivery of home heating B100 and wholesale to Georgian Biofuels which Loughneys owns 50% of.

D48: In Member Handbook on website.