An Investigation into Organic Waste Management: Bin Liners

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Abstract

Climate change has been a growing issue over the past few decades, and as such, reducing greenhouse gas emissions and our carbon footprint are becoming an increasingly talked about issue. The separation of organic waste from other waste streams helps mitigate the damage being done to the environment as a result, composting programs all over the world are now being introduced in an aggressive fashion. The University of British Columbia currently has a composting program in place with two main initiatives; residential and on-campus composting. The aim of this report is to address the problems that are currently associated with the program, foremost including the cleanliness and odor of the containers. to be taken into consideration while investigating this issue will be the type of container, convenient methods of keeping them clean by using items such as bin liners, as well as minimizing costs and efforts by users and maintenance operators.

Research of similar programs, and investigation of suitable bin liners were the primary means to get our desired data for the larger green carts found on campus, while surveying current residents helped us come to our final conclusions on residential composting. After extensive searching, we found many bin liner options, varying in price, size and material, but only few meeting our criteria. The biggest issue when looking for green cart solutions were finding ones with the correct specifications as well as being economically viable. Our final recommendations include using cardboard liners manufactured in Asia custom made to our current bins specifications for a very low cost. Comparatively, we adopted the concept of homemade newspaper bin liners for the smaller residential food scrap pails using commonly found campus and city newspapers. Use of infographics to promote the usability and simplicity of the program, residents need only make a couple of folds to rid themselves of the odorous and unsanitary bins.

TABLE OF CONTENTS

LIST OF FIGURES AND TABLES

1. INTRODUCTION

UBC produces approximately 1900 tons of compostable waste material every year. A growing problem within the community is that the organic food waste is going to the landfills, instead of its intended destination at UBC's compost processing plant. This report's purpose is to look at this problem in terms of what can be done to increase the student body's participation in the program, how bad smell and cleanliness of the bins can be maintained, as well as what can be done to decrease the operating costs paid by UBC.

Currently at UBC, the composting program consists of two main components, residency programs and main campus buildings. Small portable food scrap pails are used in campus residencies, as well as some building staff rooms and it falls under the responsibility of the tenants to monitor and empty their personal bins. The second aspect of the composting program are the larger food carts available to all students and faculty located in various locations on the UBC campus. These bins can hold up to 140L and are emptied and maintained by UBC staff on a regular basis. Smell has become an issue with these, as it can take a few days before the bins are full, thus the waste degrades. At this point in time, the large food carts are being lined with plastic bags as a temporary measure until a better bin liner is found.

After polling a student population which consisted of friends living at different UBC residencies and from a variety of faculties, two major concerns about the use of the small food pails were identified: the amount of effort involved, and the smells coming from the pails. These findings coincide with the concerns that Bud Fraser put forward pertaining to the maintenance of the larger food carts since

UBC spends a lot of money on cleaning the carts in order to minimize their smell. For both the small food pails and the large food carts, the use of a proper liner would ease maintenance involved with cleaning and transport, and in turn reduce the smell of the bin since less organic matter will be left inside. As research was done, two main ideas were engendered and their feasibility was tested. The first idea is to use readily available newspapers on campus to make bin liners for residence compost pails. The second idea is to line the larger food carts with a compostable paper/cardboard liner. In the following sections both concepts will be gone over in detail, every pro and con will be explored and a recommendation will follow the results.

2.0 RESIDENCE NEWSPAPER BIN LINERS

When looking through the many materials that can be used for compost bin liners, newspaper was found to be a common and effective resource. On a large scale, it would be inefficient, but it works well for smaller personal sized bins. On the UBC campus, there are small compost bins in the residencies used by students. Questioning and experimentation has resulted in the speculation that the Ubyssey (a campus-wide periodical), Georgia Straight (city-wide periodical), or other easily accessible newspapers could be used to make these bin liners.

There are several reasons why newspaper makes for an effective bin liner, especially on campus. They are as following:

- Newspapers and periodicals such as the Ubyssey are free, in abundance and easy to access on campus
- The campus composting and waste management plants are able to handle newspaper
- Making a bin liner with the newspaper is quick and easy, with various available methods
- The papers are already in circulation, so no new product has to be made for the liner

There are also setbacks, as listed below:

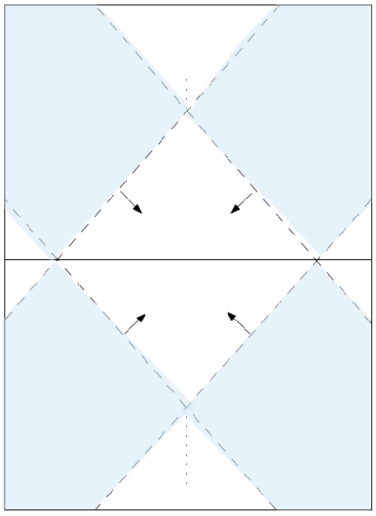
- Students would be responsible for making the liners (this can be seen as a good thing from a campus budget point-of-view, but students may be less inclined to use the system)
- Newspaper is susceptible to moisture
- The capacity of the liner is limited by the page size of the newspaper

While researching these options, several students living in campus residency were consulted. There were a few common aspects of the liners that came across as the most important. When using a compost bin, students wanted a liner with enough capacity to last a couple days, the ability to be easily removed from the bin, and system that did not require them to travel long distances to empty their compost bin. Taking this into consideration, while trying to maximize the benefits of using newspaper and minimizing the set backs, two designs were made. These can be seen in Figure 1.

Figure 1: Newspaper Liner Designs (Option 1 left)

The process for making both of these liners is fairly simple. Using the Ubyssey, liners of about 2 - 2.5 L could be made. Using other papers, such as the Georgia Straight, this capacity could be increased by near double. The steps for option 1 are seen in Figure 2 and the steps beside, and the steps for option 2 are visually presented in Figure 3.

<u>Option 1:</u>



1) Lay out the paper with both pages open

2) Create four creases along the dotted lines, so that they are symmetrical and crossing at the midway vertical and horizontal points

3) Pull each side up, pinching in the corners to bring the walls together. The shaded regions in Figure 2 are the side walls, and the triangular regions are the corners to be pinched in.

4) Once the walls have been folded up, place the liner in the bin

5) For removal, pinch the tabs together and lift the liner from the bin

Figure 2: Folding diagram for option 1.

<u>Option 2:</u>

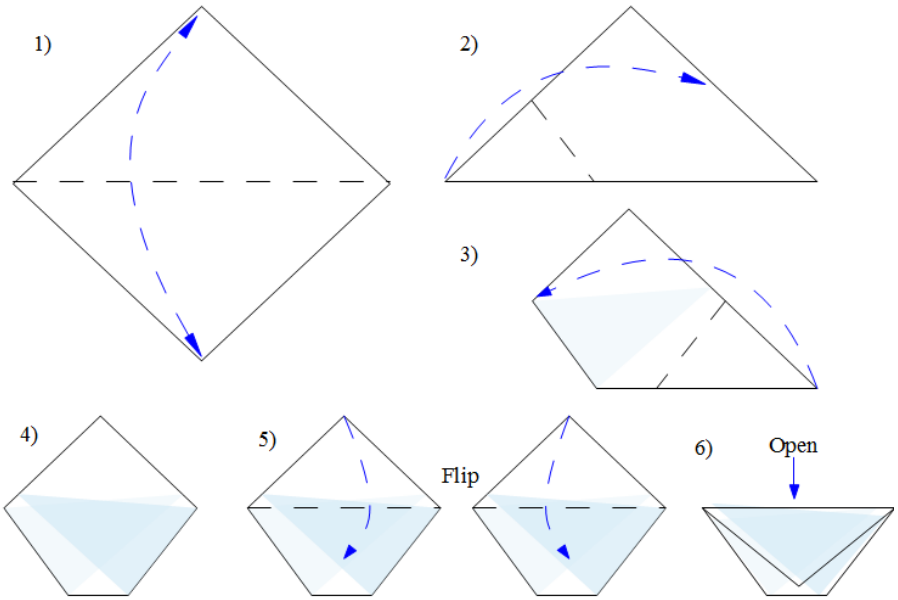


Figure 3: Folding Steps for Option 2. Source: http://www.recycle-crafts.com/origami-cup.html

Both of these designs have a set of pros and cons in their use, which are listed in Table 1 below.

	PROS	CONS
OPTION 1 (square)	• More capacity relative to page size • Easy use handles for liner removal • Fill bin space effectively • Can sit upright on its base	• Needs a bin to stay together • Slightly more complicated to fold • May need a custom bin
OPTION 2 (rounded)	• Easy to fold • Slightly more sturdy • Bin not required to stay together	• Need support to stand upright • Susceptible to tearing • No handles for removal

Table 1: Pros and cons for newspaper liner options 1 and 2.

As seen from Table 1, with each option having various setbacks, there are a few further considerations that need to be made before determining if either is a viable option. For option 1, a test would need to be conducted on the compatibility of the liner with current bins on campus and whether or not a new bin type would need to be constructed. If a new bin was required, it is speculated that it would not be a very expensive or difficult task, and could perhaps be a task for an engineering design course. For option 2, the issue of no handles for removal may need to be addressed, depending on the system put in place. For both options, there are two further issues requiring attention. The first would be the newspaper's inability to handle moisture, and the second being the size of the liners made using campus-wide available newspapers.

Taking all of this into consideration, the following options are available concerning newspaper compost bin liners in campus residences:

- Using bin liner option 1, with the possibility of distributing new compost bins
- Using bin liner option 2, with a system that requires carrying the whole bin to the dump site

Two alternative ideas to consider:

- Create a compost portion of the garbage chutes in residence by installing a sheet metal separator
- Install a system where bins are carried down to the disposal area, and then left there. Students could then bring down the bins whenever they were leaving and give them a quick rinse, and grab a new one next time they were going up to their room.

3. 140L COMPOST BIN LINER OPTIONS

As a group, research was done into bin liners. It became apparent that to use a liner for every compost bin on campus would be quite expensive. For this reason, it would be best to only use liners for the larger 140 liter bins. Lining these would reduce the smell and the effort required to maintain them which in turn, would increase the participation in the composting program.

The constraints that UBC has for the bin liners also adds difficulty to the situation. Currently, the processing plant cannot handle compostable plastics; this means that a paper liner is needed. Using paper liners has a few setbacks as opposed to plastics which are as follows:

- Paper liners have fixed dimensions and will need to be made to fit UBC's bins
- Paper liners can be more expensive than plastic on
- Paper liners weaken when wet. This could become an issue given Vancouver's typical wet weather.

Taking into consideration all of the above, it would still be beneficial to use these paper liners for the larger bins. After doing research into what type of paper liner would be best for the job, the costs were taken into consideration. Using mostly online wholesale

distributors, a general cost per liner was obtained. The average cost for a compostable plastic bag was 60 cents while the average cost for a paper liner was approximately one dollar (binlinersdirect.com, 2014). To calculate the total costs for lining the large bins on campus, we used information about the average number of compost bins sent to the plant. This information was given to us by Bud Fraser and is as follows:

- UBC sends 500 bins a weekday to the plant for the fall and winter school semesters
- In the summer semester, this number falls to 100 bins a week

Using these averages we came up with a formula for the general cost of lining the bins every year. The formula was (500 bins a week x 32 weeks) + (100 bins a week x 16 weeks) = X amount of bins a year. This equated to around 18000 bins processed every year. As a result, it would cost UBC approximately $18 000 every year in bin liners alone. This is a significant amount of money and a way to reduce it is needed.

After further searching into paper liners,a website was found that sells liners in large quantities of 2000 or more. The name of the website is Alibaba.com and it links wholesale suppliers to buyers worldwide. Suppliers originating in china can sell 2 ply compostable paper bags that can be made to specific dimensions for the cost of $0.1 to $0.4 USD a bag. The cost depends on how many bags are ordered. If UBC where to order 18000 liners, the price would be around 12 cents per liner. This would lower the overall cost to only $2000 a year. Alternatively, UBC could order the liners from a North American supplier which would increase the costs to 30 cents a liner. The pros and cons of offshore and North American suppliers are listed in the table below.

140 liter paper bin liners	Pros	Cons
Offshore supplier	- Lower price ($0.12 USD a liner) - Option to specify dimensions - Custom printing	- Negative stigma associated with mass produced chinese products - Not supporting Canadian economy - Increase in carbon footprint to due greater distance travelled
North American supplier	- Faster shipping - Better customer support - Supporting Canadian economy - Custom printing	- Higher prices ($0.30 USD a liner) - No option to specify dimensions

Table 2: Pros and cons of liner sources.

Taking the above facts into consideration, It would be best to use an offshore supplier for two reasons. One the price is the lowest which will increase the likelihood for UBC to fund this project. The second is the option to specify the dimension of the liners you order. The 140 liter bins that UBC uses have unique dimensions and it is difficult to find a liner that fits correctly. Ultimately, by using these paper liners, the 140 liter bins will remain cleaner and more people will use them. This will be a cost-effective solution to the problem.

4.0 Conclusion

In this report, research was conducted to determine the main concerns governing the decision for which liners should be adopted by UBC's composting program. Pros and cons for various liner options which accounted for the required criteria were considered for each bin size. As a result of the research conducted, recommendations can be made for the liners for each bin size. Folded newspaper liners utilizing papers that can be found easily around the UBC campus (Ubyssey, Georgia Straight etc) is recommended for the small residence pails as a clean, cheap and simple solution. For the 140L food carts, buying custom paper bin liners from an offshore supplier through Alibaba.com is highly recommended as it is the best fitting and has the cheapest price per liner compared to other products that were considered.

Going forward, there are some other options that may be worth considering. At UBC's Gage residence, it could be worth while to modify the garbage chute to be used for compost instead. In doing so, students would no longer have to carry their compost down to ground level, thus increasing student participation. Alternatively, instead of having a designated pail for each room/apartment that the residents are responsible for, a different system could be put in place where residents can more conveniently dispose of their compost at a pail disposal/rinsing station on their way out of the residence on their way to class, and then pick up a new pail on their way in.

REFERENCES

"An Origami Cup For Your Counter Top Compost Bin." *Recycle-Crafts*. N.p., n.d. Web. 12 Mar. 2014. <http://www.recycle-crafts.com/origami-cup.html>.

Below is two example distributors links on Alibaba.com. All distributors of paper bags can be found at http://www.alibaba.com/products/F0/yard_waste_bag/CID230106.html

wet strength yard waste packing recycled Leaf Bag. (n.d.). www.alibaba.com. Retrieved April 10, 2014, from http://www.alibaba.com/product-detail/wet-strength-yard-waste-packing-recycled_1674690247.html

Yard Waste Bag-Yard Waste Bag Manufacturers, Suppliers and Exporters on Alibaba.comPackaging Bags. (n.d.). Yard Waste Bag-Yard Waste Bag Manufacturers, Suppliers and Exporters on Alibaba.comPackaging Bags. Retrieved April 10, 2014, from http://www.alibaba.com/products/F0/yard_waste_bag/CID230106.html

UK's Leading Supplier Of Recycled, Degradable and 100% Biodegradable/Compostable Dustbin Liners. (n.d.). Bin Liners Direct. Retrieved April 10, 2014, from http://www.binlinersdirect.com