

An Investigation into the Benefits of Remanufactured Toner Cartridges

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ABSTRACT

This report looks at the economic, environmental, and social aspects of the use of remanufactured cartridges within the UBC community by faculty and students. Currently, the vast majority of the campus consumes large amounts of OEM toner cartridges. With this consumption, there is the opportunity to remanufacture the used cartridges and reduce the carbon footprint of the campus as a result.

This report will explore the effects of adopting remanufactured cartridges limited strictly to the campus bound by University Boulevard and Marine Drive. The research has been done under the assumption that should the university decide to adopt the use of remanufactured cartridges the overall usage of toners will not increase dramatically as a result. The assumption was also made that the used cartridges will be returned properly to a third-party to be remanufactured. The industry investigated by this report is relatively new and lacks regulation as to what can be certified as a remanufactured cartridge and as a result the report will assume that a remanufactured cartridge is a cartridge that is capable of being used up to the expected lifetime of an equivalent OEM cartridge. Most relevant material is several years old and some figures in regards to the waste and the reduction the carbon footprint are not available due to the industry's relative youth. Within the industry is a company known as Digitech which will be a stakeholder should the adoption of remanufactured cartridges be undertaken.

The research draws upon research papers in regards to the remanufacturing, and manufacturing process of toner cartridges as well as a student survey taking place on the UBC campus. The research suggests that adopting remanufactured cartridges will on reduce the costs of obtaining cartridges from 10%-30% while also reducing the carbon footprint of the toner use on campus by at least 50%. Socially, the report has found that students of UBC are willing to use the remanufactured cartridges and also has exposed the underlying problem of the problem which involves public opinion as well as lack of knowledge. With the results of the research, the adoption of the use of remanufactured cartridges is recommended. It is also recommended that collection bins for used cartridges be implemented around campus and dorms as well as an on campus location to encourage students to purchase the toner cartridges.

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GLOSSARY

Alma Mater Society	UBC's student union; an organization that provide a number of services to the student body ranging from a campus newspaper to counselling services and more.
Remanufactured Toner Cartridge	A toner cartridge which has been partially disassembled to remove any defective components and then reassembled and refilled to be redistributed
Ubysey	UBC's campus wide newspaper run by students on behalf of the AMS

LIST OF ABBREVIATIONS

AMS	Alma Mater Society
GHG	Greenhouse Gas
OEM	Original Equipment Manufacturer
UBC	University of British Columbia

1.0 INTRODUCTION

Currently, the vast majority of the campus consumes large amounts of OEM toner cartridges and either discards or recycles the cartridges when they are out of ink or toner. This report will look at the environmental, economic and social aspects of the use of remanufactured cartridges within the UBC community by faculty and students and will explore the effects of adopting remanufactured cartridges as the new standard cartridge.

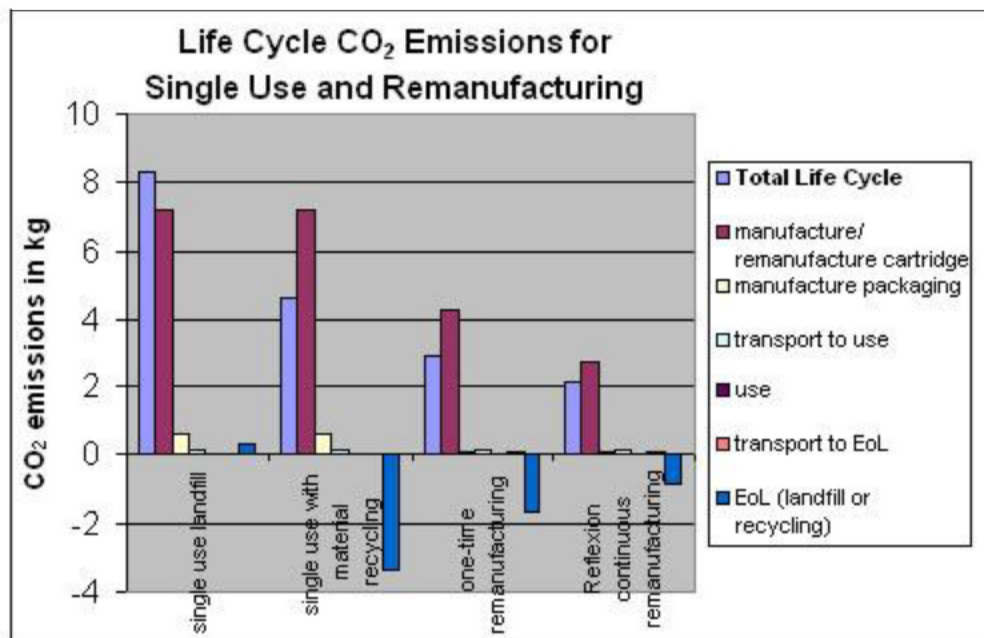
2.0 ENVIRONMENTAL ANALYSIS

The environmental analysis was completed by gathering information pertaining to the life cycle of both OEM and remanufactured ink and toner cartridges from previously conducted research. This information was then analyzed and compared to determine the most environmentally beneficial option for UBC.

2.1 ENVIRONMENTAL IMPACTS

The manufacturing process and disposal of ink and toner cartridges has a negative effect on the environment due to the use of fossil fuels and the emission of GHGs. Toner cartridges, which are approximately 40% plastic, require over 3 litres of oil in their manufacturing process and produce approximately 4.8 kg of CO₂ (Preton Ltd., 2010). The remanufacturing process, however, reuses components from recycled cartridges, requiring fewer materials and producing less CO₂, at approximately 2.4 kg (Preton Ltd., 2010). Error! Reference source not found. displays that the total life cycle cost of using OEM cartridges only once and not recycling the used cartridges is almost triple the cost of remanufacturing the cartridge even once.

Figure 1: Life Cycle Comparison of OEM and Remanufactured Toner Cartridges



PE International (2013) Reflexion Life Cycle Analysis

<http://www.tecnolaser.com/reflexionstudy.aspx>

Another important consideration is the disposal cost of a toner cartridge. As a result of the toner cartridges' material composition, the cartridges can take from 450 to 1000 years to degrade (Cabler, 2012). By recycling or remanufacturing these cartridges we greatly reduce the amount of solid waste in landfills by a significant amount.

2.2 ENVIRONMENTAL RECOMMENDATIONS

Based on the evidence provided in the previous section, environmentally, UBC should use remanufactured toner cartridges in place of new OEM toner cartridges as much as possible. This practice will keep a large amount of solid waste out of landfills and reduce the need for new materials for toner cartridges, which in turn will decrease petroleum product consumption. Furthermore, using remanufactured toner cartridges will reduce GHG emissions by a considerable factor and thereby shrink UBC's carbon footprint.

3.0 ECONOMIC ANALYSIS

The economic analysis was completed by gathering information in the aspect of cost, quality and market demand. The recommendation about the use of remanufactured toner cartridge in UBC was given by analyzing the information.

3.1 Economic Impacts

The most advantage of remanufactured toner cartridge over the OEM toner cartridge is the cost. The price of the remanufactured toner cartridge is about 30% to 50% less than the OEM toner cartridge (Vasudevan, Kalamkar & Terkar, 2012). The average price of the OEM toner cartridges is about \$130. This can be a huge cost reduction in office supply cost when using the remanufactured toner cartridge. Figure 2 shows the cost saving due to remanufactured cartridge over OEM new cartridge in different brands.

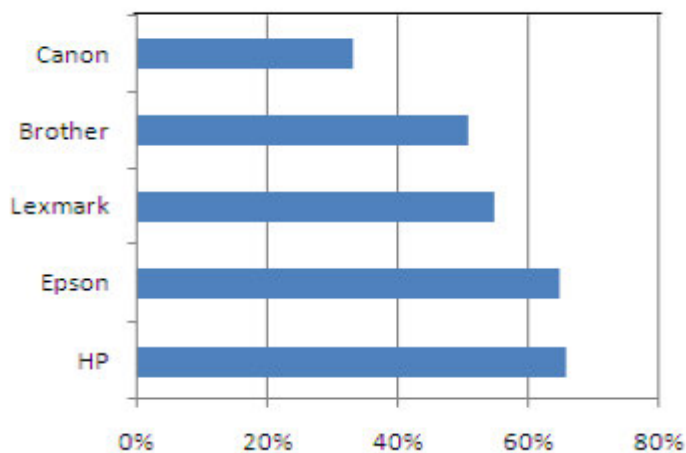


Figure 2 Cost Saving Due to Remanufactured Cartridge Over OEM New Cartridge in %

The quality of the remanufactured toner cartridge is an important fact in the market. The quality varies by different remanufacturers. However, there is a standard remanufacturing process of toner cartridge which can produce high quality toner cartridge as good as OEM product. The 10 steps for remanufacturing process are: Incoming Raw Materials Inspection, Sealing, Sort & Grade, Assembly, Recycle, 100% Post Testing, Split & Clean, Packaging, Digital Auto Filling, and Quality Control (Vasudevan, Kalamkar & Terkar, 2012). The toner cartridge is tested for the original quality in the step of incoming raw materials inspection. Then the cartridges are sorted and graded to ensure high quality. In the step of recycle, all packaging material and other parts are recycled. Then the automated equipment is utilized to clean the inner part of toner cartridge. In the step of digital auto filling, the automated equipment fills each cartridge with premium toners at the exact specified weight. A sealing process for all the toner cartridge is preformed with an OEM style seal on each toner hopper. The technicians assemble all cartridges with 75% new components, which can ensure the high quality of the produce. Then the cartridge is post tested and packaged. All these steps can produce a good remanufactured cartridge.

Due to the good quality and low cost of remanufactured toner cartridge, the market for it is well-demand. Figure 2 shows the maximum sale volume of remanufactured cartridge for different brands.

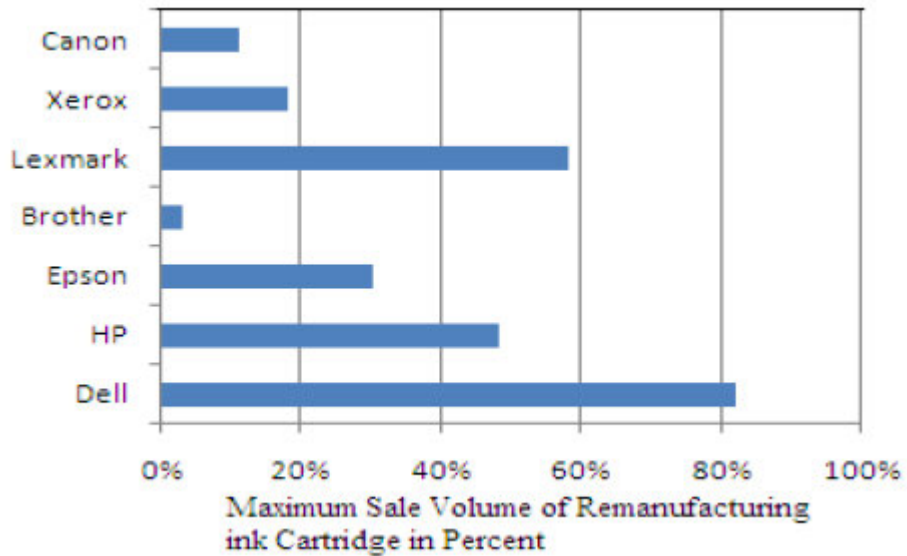


Figure 3 the maximum sale volume of remanufactured cartridge for different brands

For recent remanufacturing produce development, most manufacturers get used OEM product form the third party or the retailer who is collecting the OEM products from consumer. Consumer always feels comfortable to return OEM product to retailers. If remanufacturers can get used products from consumer directly, it can reduce cost further more.

3.1 Economic Recommendations

Since the cost of remanufactured toner cartridge is very low and if the quality of it can be controlled, we can use them in UBC, which can save a great amount of annual spending on toner cartridges. However, the OEM toner cartridge is still needed due to its extreme high quality. The failure rate of the OEM product, such as HP, is only about 3%, while remanufactured toner cartridge may not achieve that point. If UBC can directly get products directly from remanufacturer rather than retailer, it can reduce cost further more. The quality of the products UBC get can be also controlled.

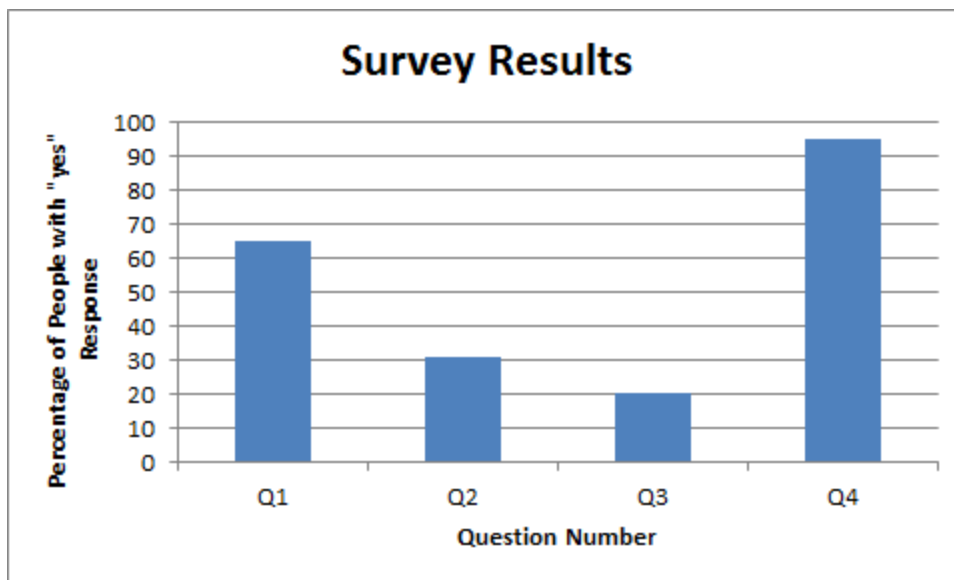
4.0 SOCIAL ANALYSIS

The social analysis was done by gather information in the form of a survey for the general student populace. This was considered the most effective way of obtaining data as other research material did not reflect the thoughts of the current populace. Other information was obtained through the Sustainability Project workshop on October 8, 2013.

4.1 SURVEY RESULTS

The survey took place on campus at 5 locations: the Gage Towers lobbies, Walter C. Koerner Library, Woodward Library, Place Vanier, and the UBC Bookstore. These locations were chosen as areas with a large number of students from a variety of different years and fields. The survey (Appendix A) was conducted in person within these buildings, including a sample size of 100 people who will remain anonymous. Three yes/no questions and a short response question were asked as well as some feedback on their answers.

Figure 4: Results of the Survey



Lam O. (November 10, 2013 - November 15, 2013) Survey

According to the survey, 65% of the campus owns or shares a printer of their own which means they obtain their own cartridges. As a result, it is not enough for UBC to adopt remanufactured toner cartridges in their own printing systems in order to reduce the campus' carbon footprint. It would require the cooperation of the student populace as well. Questions 2 and 3 were meant to address the student populace in terms of their mindset towards the remanufacturing toner cartridge industry. In regards to question 2, it was explained to the participant that a "yes" response would indicate that the participant has prior experience with using remanufactured toner cartridges or know of someone who has used or is using a remanufactured toner cartridge. Anything less would could have been ruled as inferring the knowledge from the words "remanufactured toner cartridge" and thus is discarded. Question 3

was only asked to those who responded “yes” to question 2. The results show that less than a third of the student populace know of the industry and 20% of the student populace have a bad perception of the industry. Further response linked this perception to failures of the product which was often considered a byproduct of the cost. This indicates that UBC in addition to encourage the use of remanufactured toner cartridges but also educate students of their benefits. Question 4 was based on figures projected by Digitech owner Dave McConachie during a workshop on October 8, 2013. It was asked to see what it would take to convince students to use remanufactured toner cartridges and how firmly rooted the negative preconceptions were. The results show that 95% of the student populace could potentially be willing to adopt remanufactured toner cartridges. The minority maintains that while the remanufacturing process remains highly unregulated in what can be considered remanufactured, there remains a problem with credibility and reliability which they would not risk.

4.2 SOCIAL IMPACTS

The projected social impacts of the introduction of remanufactured toner cartridges may include increased consumption. While the use of public printers will most likely remain the same due to its standard fee per page, the use of personal printers will increase as they do not have the same cost per page limitation in addition to the cost for the toner cartridge. A positive impact would be the exposure of properly remanufactured toner cartridges to the public and serve as an example to encourage further change. With the reduced cost, and little need for adaptation, the remanufactured toner cartridge can readily be accepted by the student populace and staff if the proper collection methods are utilized as some survey participants emphasized. The need for staff to collect the cartridges may create more job positions depending on the number of cartridges collected.

4.3 SOCIAL RECOMMENDATIONS

Socially, the major problem given by the introduction of remanufactured toner cartridges does not lie with the campus utilities such as public printers but with the number of personal printers within campus. As a result, it is recommended that UBC encourages the use of remanufactured toner cartridges, to set an example to both the students and the surrounding community. While preconceptions are changed, the industry is given more publicity which could help incite demands for regulation which could improve the overall performance and reliability of remanufactured cartridges. Methods to increase publicity may be an article stating a change of staff and public printers to remanufactured toner cartridges in the Ubyyssey, the university newspaper, or information posted around areas with public printers as well as links on the UBC library website which would advertise the change.

5.0 CONCLUSION AND RECOMMENDATIONS

Remanufactured toner cartridge has several advantages, such as low cost, and less greenhouse emission. The quality of remanufactured toner cartridge is as good as OEM product. Even though it is well demanded in the market, there are still some challenges, such as expectation of quality, supply limitation, competition between industries. As mentioned in social analysis, people are concerned with quality and supply location. Recently, some researches also show that cost saving has impact on remanufactured toner cartridge demand.

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APPENDICES

A SURVEY (WITH RESULTS)

1. Do you own or share a printer?
 - Yes (65)
 - No (35)
2. Do you know about remanufacturing or refilling toner cartridges?
 - Yes (31)
 - No (69)
3. Is the industry good or bad and why?
 - Good (11)
 - Bad (20)
4. If a remanufactured cartridge was 10-30% cheaper than an OEM, with a 96% success rate, and reduced the carbon footprint of the campus, would you use this product?
 - Yes (95)
 - No (5)