

MAIN CONCLUSIONS OF STUDIES AND DATA DEMONSTRATING THAT THE CARBON FOOTPRINT OF REMANUFACTURED CARTRIDGES IS LOWER THAN THE CARBON FOOTPRINT OF NEW CARTRIDGES

Remanufactured cartridges have a much lower CO₂ emission than new cartridges. This commonly known fact is substantiated by many scientific studies. Several studies and articles available in Europe today are listed below, with their respective internet location and main conclusions:

1 An Investigation into a Triple Bottom Line Analysis of Remanufactured Toner Cartridges vs. OEM Cartridges, APSC 261, November 28, 2013, University of British Columbia

<http://sustain.ubc.ca/sites/sustain.ubc.ca/files/seedslibrary/Report%20APSC%20261%20Toner%202.pdf>

It is often difficult to qualify why the consumer base is hesitant to purchasing remanufactured toner cartridges. We believed that the main reason for this is that in general, the public are unaware of the sustainable positive attributes of remanufacturing, or have been misinformed through marketing strategies of large OEMs.

2 Study by Golisano Institute for Sustainability, Brian Hilton, 2011

<http://lcacenter.org/lcaxi/final/445.pdf>

Extract of the key conclusions:

*-Model shows that remanufacturing provides significant life cycle benefit compared to new
-Major benefit from part material and process recovery*

3 Xerox client info flyer "Xerox Green World Alliance Managing supplies responsibly", 2010

<http://www.xerox.com/digital-printing/latest/GWAFL-01UA.pdf>

Extract of the key conclusions:

On average, approximately 60% by volume of the used cartridges returned to Xerox are remanufactured. Remanufactured cartridges, containing an average of 90% reused/recycled parts, are built and tested to the same performance specifications as new products. Remanufacturing a cartridge saves up to 80% of the energy that would be required to produce a new cartridge and keeps on average 2 lbs. of used materials from winding up in landfills.

4 Study by the Danish government environment agency Miljoministeriet on eco-labeling , 2009

http://www2.mst.dk/common/Udgivramme/Frame.asp?http://www2.mst.dk/udgiv/publications/2009/978-87-92617-03-3/html/helepubl_eng.htm):

"Depending on how much the devices are actually used, the significance of the production of the printer itself is relatively insignificant (especially when printing large quantities). This means that when focusing on environmental aspects, the product development of printers should focus on toner (and paper) rather than the hardware.

The conclusion of the Ecoinvent data is that for printing devices the consumption of toner has higher environmental impacts than the electricity use. Focus should be put on designing toners with less environmental impacts."

5 Study "Carbon Footprints and Ecodesign of Toner Printer Cartridges", by Dr. Michael Gell, Xanfeon, December 2008

<http://www.therecycler.com/UserMedia/EditorUpload/RPE%20Report%2009.pdf>

Extract of the key conclusions:

" A study has been made of carbon footprints of short-life and long-life toner cartridges comparing the carbon footprints of OEM cartridges with those of corresponding remanufactured cartridges. The carbon footprints have been evaluated on the basis of actual profiles of components replaced during refilling cycles. In the case of short -life cartridges, the percentage saving in carbon footprint through repeated refilling cycles is about 25 to 40% compared with that of using the equivalent number of new cartridges.

In the case of long-life cartridges, the avoidable carbon foot print achieved through use of remanufactured cartridges rises to about 60%. Scaled across world markets, potential savings in CO₂ emissions associated with the use of long -life cartridges are estimated to be about 0.4 M tonnes CO₂ worldwide / year. It is recommended that ecodesign opportunities for long-life cartridges are examined in the development of extended producer responsibility legislation, such as the European EuP Directive. The

avoidable carbon footprint (about 60% of carbon footprint) is a useful metric for customers choosing to purchase long-life remanufactured cartridges in favour of new ones.”

6 “The carbon footprint of remanufactured versus new mono-toner printer cartridges”, by Dr. Hudai Kara, Best Foot Forward/UK Centre for Remanufacturing and Re-use CRR, UK, 2008

(http://www.remanufacturing.org.uk/pdf/the_carbon_footprint_of_remanufacturing_printer_cartridges.pdf)

Extract of the key conclusions:

“This study compares the carbon footprint of a remanufactured cartridge with that of a new one, taking into account raw materials, energy, transport and disposal. The remanufacturing process saves approximately 2.5 kg of CO₂ per cartridge compared to the production of a new cartridge. From data collected at Cartridge

World, a mono toner cartridge can be remanufactured on average 3.5 times, meaning the carbon footprint from the production of the original cartridge is amortised over this extended lifetime. This needs to be added to the carbon footprint to gain an overall remanufacturing footprint. Based on these assumptions the carbon footprint of remanufactured cartridge is approximately 2.8 kg, which is 2 kg (46 %) lower than that for a new cartridge.”

7 “Life Cycle Assessment of Toner Cartridge HP C4127X -Environmental impact from a toner cartridge according to different recycling alternatives” by Jonas Berglind & Henric Eriksson, January 2002, University of Kalmar, Sweden

<http://www.etira.org/wp-content/uploads/2013/07/LCA-Kalmar-Univ.pdf>

Extract of the key conclusions:

“When, besides paper, the electricity, that is consumed, using the toner cartridge, is excluded the result is that the re-use alternative is full measured two times better than the other alternative is. Since paper manufacturing and electricity consumption at use are not directly corresponding with the toner cartridge, its manufacturing, restoring and after life treatment, this result (full measured two times) can be seen as the most significant when comparing the two alternatives. Though, paper and electricity are needed to fulfill the functional unit.”

The study shows that for the main scenario, with paper, where activities connected to the use of paper are included, a toner cartridge that is re-used twice, are between ten and twenty percents better, from an environmental point of view, than a toner cartridge that is sent to HP’s recycling program, according to the used data categories and methods for environmental impact assessment. If the paper is excluded from the environmental impact, the alternative scenario, without paper, there is a great difference in the result. The re-use alternative is in this case up to 90 % better with some methods of assessments. For all the methods the difference is less than two times though.

8 “Environmental Issues within the Remanufacturing Industry”, by Mattias Lindahl, Erik Sundin and Johan Östlin, Department of Mechanical Engineering, Linköping University, Sweden, 2006

<http://www.mech.kuleuven.be/lce2006/117.pdf>

Extract of the key conclusions:

“This paper has shown that remanufacturing for the industrial cases analyzed is a preferable scenario compared with the replacement of newly-manufactured products. This is valid from material resource perspective for all the cases investigated. Furthermore, in the REKO cases the LCA results show that remanufacturing is also beneficial from an overarching environmental perspective.”

The Report also says that more research is needed.

9 “Initiatives to Help Create a Recycling-Oriented Society”, Minolta Environmental Report 2003

<http://www.konicaminolta.com/about/csr/environment/pdf/report/minolta/2003/2003envir5.pdf>

Extract of the key conclusions:

Using this new LCA method, Minolta has analyzed environmental impact of toner cartridge reuse and recycling processes, and found that reuse and recycling impose less impact on the environment than incineration or landfill treatment, since greater amount of energy is saved than that is consumed in reuse/recycling processes. Moreover, it proved that reuse is still better for the environment than recycling.