

# THE BOTTOM LINE

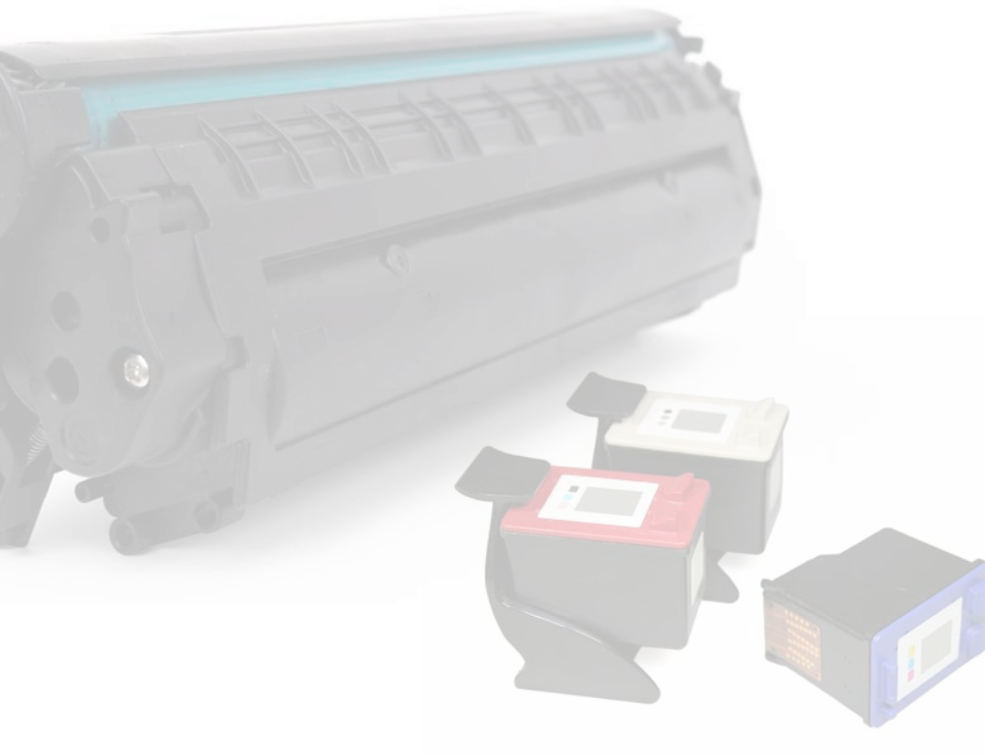
A Purchasing Guide for Imaging Supplies



# Table of Contents

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Introduction.....	3
What the Research Says	
Quality .....	4
Remanufacturing Process	
Warranty Rights	
Value .....	7
Fair Packaging and Labeling Act	
Recent OEM Page Yield Claims	
Environment.....	8
Remanufacturing Closed Loop Process	
Conclusion.....	11





# Remanufactured or OEM Imaging Supplies?

## An Analysis of Quality, Value and Environmental Impact

Have you ever tried to analyze the total cost of ownership for your printer? If so, you probably quickly became frustrated. That's because printer ink is one of only a handful of products that is exempt from Federal Trade Commission regulation under the Fair Packaging and Labeling Act. By not revealing cartridge volume on the packaging, it is nearly impossible for businesses and consumers to compare prices or determine the true cost of printing with their ink or toner cartridge. And, printer manufacturers (OEMs) have a vested interest in maintaining status quo, while consumers and businesses continue to shell out big bucks for their exorbitantly priced toner and ink cartridges.

But, there is a high quality, low cost, environmentally-friendly solution on the market that offers OEM results for a fraction of the price. If you think it sounds too good to be true, just take a look at what the research has to say...

### **DEFINITIONS:**

#### **OEM Cartridges**

OEMs, or original equipment manufacturers, are the companies that manufacture the printers and the imaging supplies to support those printers, including laser toner and inkjet cartridges. A few of the most commonly known OEMs include: Lexmark, Hewlett-Packard (HP), Canon, Brother, Epson, Xerox and Ricoh.

#### **Remanufactured Cartridges**

Remanufactured cartridges are essentially ink and toner cartridges that are remanufactured using the empty cores. Remanufacturers, like Clover Technologies Group, collect empty cartridges, inspect, clean and replace key components including: the OPC (Organic Photo Conductor) drum, wiper blade, PCR (Primary Charge Roller) and magnetic roller. Remanufactured cartridges are sold through leading office products distributors and resellers and marketed under a variety of private label brands.



## What the Research Says:

### **QUALITY – All Remanufactured Cartridges Are Not Created Equal**

For many businesses and consumers, hesitant to make the switch to remanufactured cartridges, quality is their biggest concern. However, according to a report from the Boston-based research firm, Lyra Research, Inc., almost 80 percent of the businesses that switched to remanufactured cartridges found them to be equal to, or exceed, OEM performance.<sup>1</sup>

#### **Components' Quality Determines Performance**

Remanufactured cartridges must be produced to stringent quality control standards, using lab-tested components, to ensure consistent OEM-equivalent performance. The process differs by manufacturer and materials used, with varying results in quality and page yields. One of the most critical parts of a cartridge is the OPC drum. Clover uses only new aftermarket drums that have a harder and more durable surface than the OEM cartridge to provide superior performance. Another key component that determines the ultimate print performance of a remanufactured cartridge is the quality of the ink or toner used. As the largest remanufacturer in the world, Clover is able to leverage its buying power and purchase the best toner and ink on the market. This assures maximum performance, density and print quality.

#### **In-House Manufacturing versus Outsourcing**

There are some remanufacturers that outsource many aspects of their business, procure sub-par components, and pay little attention to quality and patent infringement. That makes it imperative to do your homework and select a reputable remanufacturer. Clover, the industry-leading remanufacturer, has invested significant time, money and resources into developing state-of-the-art manufacturing and collection facilities and hiring world-class Research and Development and Engineering teams, located in North America to support its North America operations.

Clover has its own machine shop and designs all of its robotics and automated machinery in-house. Every empty cartridge that is received goes through a rigorous, proprietary process that is overseen by quality control specialists, ensuring that by the time it reaches the customer's hands, it performs like new. (see *Diagrams 1 and 2*) Clover's labs and manufacturing facilities have all attained ISO 9001:2000 certification, a well-respected quality standards methodology, verifying that all processes are documented and performed in a quality manner. This attention to every intricate detail of the manufacturing process is why Clover is able to back up all of its products with a 100% satisfaction guarantee.

#### **Your Warranty Rights Are Protected**

The other concern consumers and businesses may have is that using remanufactured cartridges will void their printer warranty. Not one printer manufacturer prohibits the use of remanufactured cartridges as a condition of full warranty service<sup>2</sup>. As reported by CNet, "Invalidating the warranty would violate the Magnuson-Moss Warranty Improvement Act. It's also an infraction of antitrust laws." Patricia Judge, Executive Director of the International Imaging Technology Council, states in the same article, "It's a scare tactic, because OEMs need you to buy those products in order to subsidize their hardware production."<sup>3</sup>

In the unlikely case that a cartridge did damage your printer, reputable remanufacturers will repair the product under the warranty they provide with their cartridges. On their website, Clover Technologies Group states, "In the event of any damage to a printing mechanism or component caused solely and directly by the use of this product, the manufacturer will pay the reasonable cost of service and repair."<sup>4</sup>

# 10-STEP TONER CARTRIDGE REMANUFACTURING PROCESS

DIAGRAM 1



## 1. INCOMING RAW MATERIALS INSPECTION

All incoming materials: drums, toner, blades, PCRs, magnetic rollers, etc. are verified against stringent standards before they reach the production floor.



## 2. SORT & GRADE

All empty cartridges are sorted and graded. Only premium empty cartridges are used to ensure optimal quality.



## 3. RECYCLE

All packaging materials, used hoppers and non-conforming components are disassembled and recycled.



## 4. SPLIT & CLEAN

Empty cartridges are carefully disassembled and cleaned using a proprietary state-of-the-art process. Hopper's are precisely split using custom built automated equipment. The hopper is now ready for the sealing phase.



## 5. DIGITAL AUTO FILLING

Using automated filling equipment that Clover develops in-house, each cartridge is precisely filled to the exact specified weight. Toner hoppers are filled with premium toners, which are technically matched to the OPCs (drum) for optimal yields and printer performance.



## 6. SEALING

Each toner hopper is sealed with an OEM style seal. Our quality sealing process ensures a leak-proof cartridge that is easy for the consumer to install.



## 7. ASSEMBLY

Our factory-trained technicians assemble all cartridges with OEM grade compatible components (up to 75% new components are used in each cartridge.) The assembly process includes the installation of a pre-qualified drum, wiper blade, doctor blade, PCR and magnetic roller.



## 8. 100% POST TESTING

Each and every cartridge is post tested utilizing industry standard print tests to ensure outstanding performance and quality.



## 9. PACKAGING

All cartridges receive a final inspection to ensure they conform to our stringent quality standards. Cartridges are cleaned, polished, heat-sealed in a static resistant bag and boxed. A full set of instructions and warranty information is included.

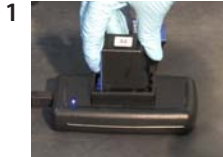


## 10. QUALITY CONTROL

Each step in our manufacturing process is monitored by dedicated Quality Control experts. Each step in our production process undergoes regular and spot inspections to guarantee that Clover's products meet the expectations of the consumer.

# 8-STEP INK CARTRIDGE REMANUFACTURING PROCESS

DIAGRAM 2



## 1. INCOMING RAW MATERIALS INSPECTION

Each cartridge goes through a visual inspection and the circuits are tested with an electrical tester to verify that they are of the highest quality.



## 2. AUTOMATED CARTRIDGE PREPARATION

Using custom built automated equipment, each cartridge is robotically opened, contents cleaned and inner foam removed.



## 3. PREPARATION & CLEANING

Highly trained technicians clean and empty each cartridge of remaining waste ink with custom- designed high capacity cleaning systems and prepare the cartridges for filling.



## 4. DIGITAL AUTO FILLING

Using proprietary filling techniques and custom-built filling machinery, each cartridge is filled to OEM specifications with custom-formulated ink.



## 5. SEALING

Clover's state-of-the-art sealing process ensures a leak-proof cartridge and a clean installation for the customer.



## 6. 100% POST TESTING

Each and every cartridge is post tested, utilizing industry standard print tests to ensure outstanding performance and quality. As a second level of quality control, two statistical checks are performed before each shipment leaves Clover's facility.



## 7. PACKAGING

Cartridges are cleaned, polished, heat-sealed in a vapor resistant bag and boxed.



## 8. QUALITY CONTROL

Each step in our production process is monitored by dedicated Quality Control experts. Work in progress undergoes regular and spot inspections to ensure our products meet the expectations of the consumer.



## What the Research Says:

### VALUE - Try Calculating the Real Cost of OEM Imaging Supplies

While the cost of printers has dropped considerably in recent years, the cost of imaging supplies has not. A recent study, by the American Consumer Institute (ACI), found that, "Inkjet printers are routinely under-priced to entice consumers to purchase the product. Once purchased, consumers are trapped into spending hundreds of extra dollars to operate the printers due to the high price of printer ink. This business model reflects the well known 'razor/razor blade model' wherein durable assets (printers) are sold below cost and 'consumables' (ink) are marked up substantially. In fact, ink is currently priced higher per milliliter than the world's finest champagne, gasoline and most luxury fragrances." <sup>5</sup> As illustrated in *Table 1*, the price per milliliter of OEM ink is far more expensive than designer perfume or Dom Perignon Champagne. <sup>6</sup> In accordance with ACI's findings, Lyra Research has documented that one OEM realizes as much as 50 percent profits on its supplies stream. <sup>7</sup>

#### Fair Packaging and Labeling Act

One of the reasons it is so hard for consumers to judiciously shop for imaging supplies is that ink is one of a handful of products that are exempt from Federal Trade Commission regulation under the Fair Packaging and Labeling Act. As ACI found in one of their studies, "This means that printer manufacturers can "slack fill" their products and profit from them; and evidence suggests that this is happening today, as some inkjet cartridges contain only one-tenth of the volume that some cartridges contained in 1999. Because there is insufficient labeling on printers and cartridges, consumers do not know the true cost to operate a printer before buying one.

According to a 2007 TeleNomic Research study released by the American Consumer Institute Center for Citizen Research, this lack of information has led to increased industry ink prices, excessive profits and high market concentration – all to the harm of consumer welfare. Moreover, better information on the cost of printing would save consumers \$6 billion per year in lower printing costs." <sup>8</sup>

Although printer manufacturers continue to make it difficult to ascertain the total cost of ownership for printers and the true cost of printing with the imaging supplies they produce, the research conclusively determines that remanufactured cartridges offer significant cost savings over OEM. ACI estimates that the average consumer with an inkjet printer spends about \$200 per year on ink. <sup>9</sup> Remanufactured ink and toner cartridges, in comparison, cost on average 30-50 percent less than OEM. <sup>10</sup> Therefore, the average consumer can save upwards of \$100 a year just by switching to remanufactured ink cartridges and the potential for savings increases exponential for businesses and consumers with a high printing volume.

#### Recent OEM Page Yield Claims

In response to Quality Logic's report which analyzed OEM cartridge page yields to various refilled and remanufactured cartridge page yields, Clover Technologies Group cartridges were recently tested against the OEM cartridges. The HP 21, HP 22, HP 92, HP 93, HP 95 and HP 98 and comparable Clover remanufactured cartridges were tested for page yield using ISO/IEC 24712 which consists of a series of five pages that are printed consecutively in order as a single job ending with a diagnostic page.

As illustrated in *Table 2*, the results of the testing determined that all cartridges remanufactured by Clover functioned fully until end-of-life as did the OEM cartridges. Additionally, the Clover cartridges yielded on average 20% more pages than the OEM cartridges.

**Table 1: Comparison of Luxury or Costly Liquids (Price per Milliliter)**

Product	Price/ML
Multicolor OEM Inkjet Cartridge	\$5.14
Black OEM Inkjet Cartridge	\$3.33
Prada Atomizer Parfum	\$1.19
Dom Perignon Champagne	\$0.17
Gasoline	<\$0.01

Therefore, the average consumer with an inkjet printer spends about \$200 per year on ink. <sup>9</sup> Remanufactured ink and toner cartridges, in comparison, cost on average 30-50 percent less than OEM. <sup>10</sup> Therefore, the average consumer can save upwards of \$100 a year just by switching to remanufactured ink cartridges and the potential for savings increases exponential for businesses and consumers with a high printing volume.

**Table 2: Page Yield Using ISO/IEC 24712 Life Test Procedure**

OEM	OEM Results	Clover Results	% Above OEM
HP 21	176	211	19.89%
HP 22	146	186	27.40%
HP 92	184	221	20.11%
HP 93	206	261	26.70%
HP 95	331	371	12.08%
HP 98	395	545	37.97%
<b>Average % Above OEM</b>			<b>24.82%</b>



## What the Research Says:

### **ENVIRONMENT - Remanufacturing Reduces Fossil Fuel Consumption & Landfill Waste**

Remanufactured imaging supplies reduce landfill waste and conserve non-renewable natural resources. It's a fact. OEMs have tried their best to refute this and promote their recycling programs in an attempt to keep empty, reusable cartridges out of the hands of remanufacturers. However, the evidence is beginning to mount that many times when an empty cartridge is collected for an OEM recycling program, instead of collected for remanufacturing, it is not ending up where the consumer intended.

In her recent article, "A Response to HP's Argument for Recycling versus Reuse" that appeared in Imaging Spectrum Magazine, Tricia Judge, Executive Director of the International Imaging Technology Council, paints a vivid picture of where many of the world's empty cartridges, that are not remanufactured, find their final resting place - Guiyu, China.

*Guiyu has become the world's dumping ground for what is defined as "e-waste." Sadly, the cartridges that end up here were originally bound for recycling. Heaps of empty cartridges line the streets and riversides after being scavenged only for their toner. Once the toner is swept out by fingers or paintbrushes, the cartridges and other printer parts are burned – fouling the air – or are discarded along the Lianjiang River. This practice of low-level recycling and then dumping has rendered local drinking water dangerous; the river contains 200 times the acceptable levels of acid and 2,400 times the acceptable levels of lead. Many residents have developed respiratory problems. A local school survey found that 100 of the 1,000 students had severe asthma or other respiratory problems. The residents here have to choose between utter poverty and pollution levels akin to poisoning. And the net gain for the average laborer? Roughly \$1.50 per day. As Imaging Spectrum has covered before, it is clear that these empties come from U.S. brokers that have been collecting large quantities of "virgin," or once-used OEM products. Such cartridges are the lifeblood of the cartridge remanufacturer, but have been diverted to this Chinese cartridge graveyard for the simple reason that they needed to be removed from the US marketplace for competitive reasons.*

#### **Landfilling and Fossil Fuels**

Judge goes on to explain in her article that while a well-known OEM's recycling efforts should be applauded, their results don't come close to matching the impact remanufacturers are having on reducing landfilling, "The recycling of 140 million cartridges over 15 years pales in comparison to the reuse of 105 million cartridges in 2006 alone. That equates to 84,000 tons of industrial-grade plastic being reused annually, not just recycled, thanks to remanufacturing."<sup>11</sup>

Each discarded laser cartridge adds approximately 2.5 pounds of metal and plastic waste to our landfills - waste that will take as long as 1,000 years to decompose.<sup>12</sup> It is also estimated that 100 million laser printer cartridges and 400 million inkjet printer cartridges are produced each year. Remanufacturing these 500 million cartridges will save an estimated four million cubic feet of landfill space. Clover Technologies Group "Zero Landfill" policy has been independently verified by McDonough Braungart Design Chemistry, LLC (MBDC).<sup>13</sup>

In addition to keeping waste out of landfills, remanufactured cartridges dramatically reduce the consumption of ecologically-damaging fossil fuels. The plastic in each new laser toner cartridge takes 3.5 quarts of oil to produce and each new inkjet cartridge requires 2.5 ounces of oil.<sup>14</sup> Best Foot Forward was recently commissioned by the Centre for Remanufacturing and Reuse to study the carbon footprint of a remanufactured mono toner printer cartridge versus a new cartridge. Their study found that the CO<sub>2</sub> emissions for a new cartridge were almost 2.5 times the emissions produced from a remanufactured cartridge.<sup>15</sup> (continued on page 9)



(continued from page 8)

### Reuse Comes Before Recycle

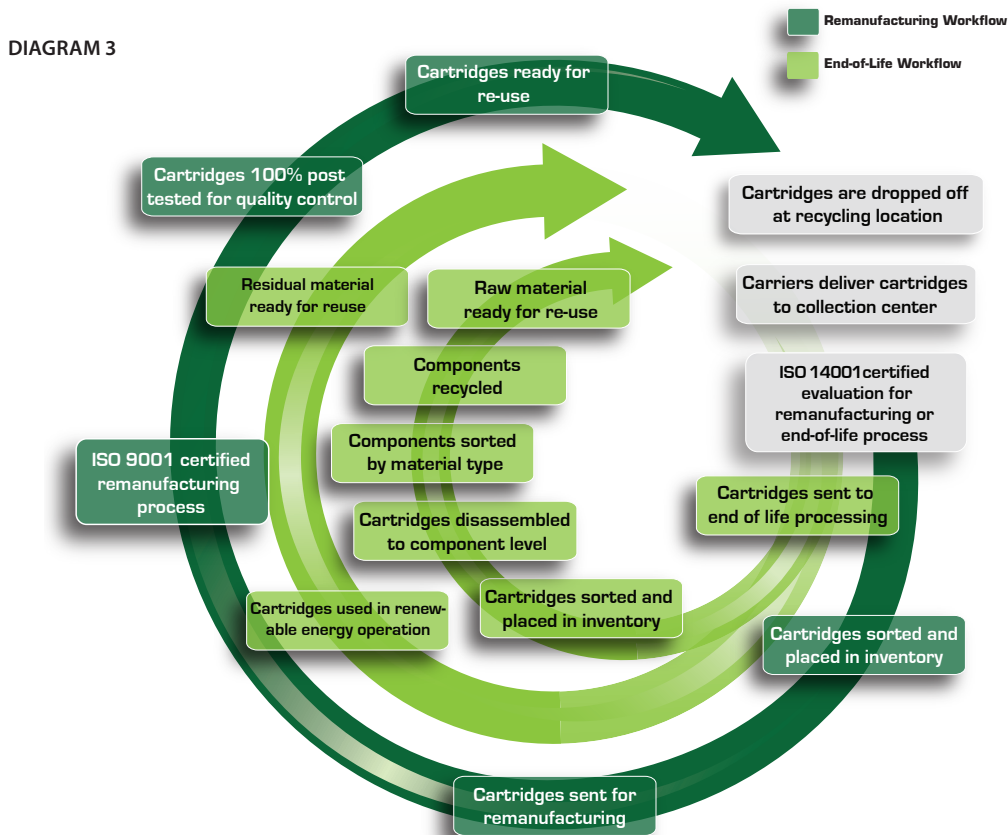
Simply stated, remanufacturing is the most environmentally responsible choice. When a cartridge is remanufactured, it is reused. Besides reducing consumption, reuse is the highest form of environmental responsibility. It is superior to recycling in that it doesn't use non-renewable resources to break-down plastic and metal. A cartridge and all its components should always first be evaluated for remanufacturing. If remanufacturing is not possible, then responsible recycling should be pursued.

This stance is echoed by multiple government agencies including the U.S. Dept. of Energy Office of Industrial Technologies and the Environmental Protection Agency. The U.S. Dept. of Energy Office of Industrial Technologies has stated that although the recycling of toner cartridges does have a number of benefits, remanufacturing is a superior choice, both environmentally and economically.<sup>16</sup> The Environmental Protection Agency's Recovered Materials Advisory Notice (RMAN) recommends that procuring agencies establish procedures and policies that give priority to remanufacturing the agencies' expended toner cartridges.<sup>17</sup>

### Closed Loop Process

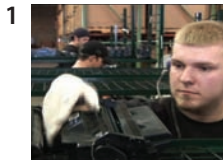
Leading remanufacturers, like Clover Technologies Group, evaluate every empty cartridge that is received; first for remanufacturing and second for material recovery through recycling. A remanufacturable cartridge is disassembled and as many components as possible are reused. Each and every component of an empty cartridge that is reused, instead of recycled, conserves non-renewable natural resources that are required in the process of recycling. This Closed-Loop Environmental Process (see Diagram 3) ensures that every component of the empty cartridges collected is either remanufactured or recycled.

Clover Technologies Group takes environmental stewardship seriously. In addition to being ISO 14001:2004 certified, Clover has committed to balancing its environmental footprint through the purchase of Renewable Energy Certificates (RECs) to offset 100% of the electricity used by its U.S. corporate offices and manufacturing facilities.<sup>18</sup> Clover packaging is also environmentally-friendly, from the corrugated box and cardboard box inserts to the installation sheets, which are printed on recycled paper. Clover remains the only remanufacturer in the industry to have its own grinding facility, where unusable cartridge components are ground and recycled into new plastic products to complete its closed loop process (see Diagram 4).



# END-OF-LIFE 6-STEP CARTRIDGE GRINDING PROCESS

DIAGRAM 4



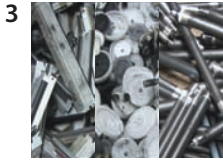
## 1. CARTRIDGE EVALUATION

All inbound units are inspected and designated for remanufacturing or grinding.



## 2. CARTRIDGES SORTED

End-of-life units are disassembled.



## 3. CARTRIDGES DISASSEMBLED

Components (plastic, blades, gears and PCR drums) are sorted for recycling.



## 4. GRINDING

Cartridge plastic is inducted into the grinder to produce plastic regrind.



## 5. PLASTIC READY FOR REUSE

Plastic regrind is reused in various injection molding processes.



## 6. NEW PRODUCT DEVELOPMENT

New product is created utilizing post consumer waste which completes Clover's closed loop process.



2.5 million cartridges processed a month



## Conclusion:

### Are remanufactured imaging supplies the superior choice for your printing needs?

With prices 30-50% less than OEM and quality that is as good as, if not better than OEM, what do you have to lose? Industry leaders, like Clover Technologies Group, have revolutionized the quality of remanufactured cartridges and there is no doubt that remanufacturing is easier on your bottom line. It's the quickest way to dramatically reduce your office supplies costs and it's the right thing to do for the environment. Talk with your office products dealer, find the name of a reputable remanufacturer and give it a try. Remanufacturers are guaranteeing you won't look back.

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- 2 International Imaging Technology Council, <http://www.consumerchoice.info/faq.htm>, February 2009.
- 3 Fairlie, Rik, "Print prudently with recycled cartridges," [http://reviews.cnet.com/1990-3000\\_7-5021258-1.html](http://reviews.cnet.com/1990-3000_7-5021258-1.html), September 6, 2002.
- 4 Clover Technologies Group, "Clover's Warranty and Guarantee," <http://www.clovertech.com/warranty.asp>, March 2009.
- 5 American Consumer Institute Center for Citizen Research, "Inkjet Prices, Printing Costs and Consumer Welfare" <http://www.theamericanconsumer.org/2007/11/19/inkjet-prices-printing-costs-and-consumer-welfare/>, February 2009.
- 6 American Consumer Institute Center for Citizen Research, "Ink Scam!" <http://www.theamericanconsumer.org/2008/09/16/ink-scam/>, September 16, 2008.
- 7 International Imaging Technology Council, <http://www.consumerchoice.info/faq.htm>, February 2009.
- 8 American Consumer Institute Center for Citizen Research, "What is the Real Cost of Owning a Printer?" <http://www.theamericanconsumer.org/2008/11/07/what-is-the-real-cost-of-owning-a-printer-2/>, November 7, 2008.
- 9 American Consumer Institute Center for Citizen Research, "Avoid Hidden Charges: When Buying, Consumers Need to Consider the Total Cost of Their Purchase," <http://www.theamericanconsumer.org/2007/10/26/avoid-hidden-charges-when-buying-consumers-need-to-consider-the-total-cost-of-their-purchase/>, October 26, 2007.
- 10 International Imaging Technology Council, <http://www.consumerchoice.info/faq.htm>, February 2009.
- 11 Judge, Tricia, "A Response to HP's Argument for Recycling versus Reuse," Image Spectrum Magazine, June 2008.
- 12 International Imaging Technology Council, <http://www.consumerchoice.info/faq.htm>, October 2008.
- 13 From a 2008 independent study performed by McDonough Braungart Design Chemistry, LLC and commissioned by the United States Postal Service, auditing the USPS Mail Back Program.
- 14 Recharger Magazine.
- 15 From a 2008 independent study performed by Best Foot Forward and commissioned by Centre for Remanufacturing and Reuse.
- 16 "Greening the Government," U.S. Dept. of Energy Office of Industrial Technologies <http://www1.eere.energy.gov/femp/pdfs/greengov.pdf>
- 17 Environmental Protection Agency, <http://www.epa.gov/epawaste/conservation/cpg/index.htm>, October 2008.
- 18 Clover Technologies Group, "Clover Technologies Group Balances Its Carbon Footprint with Renewable Energy," <http://www.clovertech.com/PressReleases/09409203Degrees.pdf>, March 2009.

version 3