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Analysis

Hewlett-Packard Continues Environmental Push for Supplies

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Abstract

In April 2010, Hewlett-Packard invited analysts to Montreal, Canada to tour its plastics compounding and recycling facility for HP inkjet cartridges. In a partnership with Lavergne Group Inc. since 2000, HP has created a process that recycles plastics from HP inkjet cartridges returned from the Planet Partners program to use again in new supplies. While HP announced this process two years ago, there are a few new developments that the company announced.

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Key Findings

- HP places great importance in environmental issues. This concern is addressed through a product's lifecycle, which starts at the product concept until its end of life.
- More and more imaging companies are also starting to place greater emphasis on environmental issues, but HP has a considerable lead position in this area.
- Interest in the environment is not expected to wane in the coming years as customers and companies investigate and evaluate best options for the environment and the available opportunities.

Recommendation

- Hewlett-Packard needs to continue with its environmental message and make it even clearer to customers so that they are continually reminded on what to with their empty supplies.

Introduction

Hewlett-Packard has been actively participating in recycling, and is using returned supply cartridges through the company's Planet Partners program in the production of supplies. Other companies, however, have been adapting similar methods and are encouraging their buyers to use their products and recycling programs. HP has been trying to differentiate itself among this new environmental awareness. If they are unable to break-out from the crowds that are running "green" programs of their own, HP runs the risk of losing the initiative it gained when the company first started its Planet Partner's program. This analysis will show that, by partnering with Lavergne, Hewlett-Packard will be able to bring recycled plastics back to virgin equivalents and introduce other initiatives that will provide greater improvement and innovation in recycling and sustainability.

HP Environmental Initiatives

The environment and sustainability issues are critical for Hewlett-Packard and concerns about each are found throughout the lifecycle of their products. In 1992, HP started the Design for Environment program (DfE), which instituted the policy that every product design team would have environmental product stewards. This would ensure that environmental design goals for energy and materials efficiency would be met through materials innovation and designs for recyclability.

This program covers the first stages of product design through manufacturing and distribution, customer use, and end-of-life. One example of a DfE initiative is the modifications allowing HP LaserJet print cartridges to be shipped in the printer, reducing the amount of packaging required. Because of this process, 90% of all HP LaserJet printers are shipped with the cartridges pre-inserted, which yields an annual reduction of 1,000 tons of corrugated and 300 tons of foam. Additionally, through design innovation, HP has cut the average number of component parts used in monochrome LaserJet cartridges by a third and the types of plastic used by more than half. This makes them easier to recycle when compared to the 1992 baseline.

The company has set aggressive goals for continued sustainability activities. Based on the company's most recent figures for 2008, HP recycled 120,000 tons of electronic products and supplies (a 6% increase compared to 2007). By 2011, HP plans to improve the overall energy efficiency of its ink and laser printing products by 40% when compared to 2005 values, as well as triple the amount of recycled materials used in inkjet printers when compared to 2007.

HP Planet Partners

HP's Planet Partners program began in 1991 for LaserJet cartridges. In 1997, it began to accept inkjet cartridges. Today, customers can recycle any brand of IT equipment in addition to print cartridges through the program. Within the last few years, HP has started reusing the plastic materials it gets back from the Planet Partners supplies return program. The company claims it used 14.4 million pounds of recycled plastic in 2009 in new HP inkjet and LaserJet print cartridges, while still meeting performance requirements. By 2011, HP has set a goal of using 100 million pounds of recycled plastics in HP printing products, collected cumulatively since 2007.

HP has recycling solutions available in more than 50 countries, regions, and territories. Return methods vary by country and by product. For HP inkjet cartridges, there are free, postage paid shipping materials available on the company's Website. Empty cartridges can also be returned to HP Authorized Retail Recycling locations. At this time, only Staples stores are HP's Authorized Retail Recycling locations where loyalty customers will receive \$2.00 Staples credit per ink and toner cartridge returned. HP plans to add other retailers in the future. Bulk boxes for inkjet empty cartridge returns are available at HP.com. The boxes can hold 20 to 300 HP inkjet cartridges or 1 to 20 HP large-format cartridges.

HP inkjet cartridges returned through Planet Partners are sent to HP's dedicated inkjet supplies recycling facility in Nashville, TN. There, the cartridges are put through a multi-phase recycling process. Products are sorted and shredded, then separated into plastics and metals. Residual ink and foam are also separated and disposed of in an environmentally-friendly manner. Recovered plastic and metal materials are further processed into their raw forms so they can be used in new HP computers, printers, and print cartridges; automotive parts; clothes hangers; microchip processing trays; serving trays; shoe soles; spools; and other products.

Figure 1: HP's Closed Loop System Diagram

Purchase an ink cartridge you can feel good about.

HP has the industry's **first** and **only** closed loop inkjet recycling process.



For a complete list of HP Original Ink cartridges made from recycled plastic, go to: hp.com/go/RecycledContent

Source: HP

For HP LaserJet cartridges, postage materials are available online or cartridges can be returned with in-box labels. With these labels, customers can return one cartridge or more via bulk boxes (these hold 20 cartridges) that are available at HP.com. Customers can also strap eight boxes together (maximum of 70 pounds). For one cartridge, the customer returns it in the empty original box.

LaserJet cartridges are sent to a recycling facility in Virginia to be reduced to raw materials that can be used to make new metal and plastic products. Similar to the inkjet process, HP claims that LaserJet cartridges also go through a “closed loop” recycling process that recovers plastic from used cartridges and processes it for manufacturing into new HP LaserJet cartridges.

For empty inkjet and laser cartridges, customers can also return large quantities via pallets—this would be about 75 LaserJet cartridges or over 1,000 inkjet cartridge per pallet. To return cartridges via pallets, customers need to separate products between inkjet and laser cartridges and remove any packaging. Customers can request pallet pickups through HP's Website (www.hp.com/recycle) and points for the HP PurchasEdge Program are awarded automatically if the customer is participating in the program. Points can be used for HP printers, scanners, PDAs, paper, and more.

Recycling Progress to Date

Cumulatively, HP has recycled more than 1 billion pounds of hardware and HP print cartridges globally, and plans to increase that number to 2 billion pounds by the end of 2010. HP has received and recycled 319 million LaserJet and inkjet cartridges through the Planet Partners program since 1991 and claims nothing returned through the program has been sent to a landfill.

Supplies

HP started looking at a “closed loop” recycled polyethylene terephthalate (RPET) program in 2000, and started manufacturing in 2005. The program officially launched in 2008. HP’s closed-loop recycling system incorporates post-consumer RPET plastics from various sources, such as water bottles and HP inkjet cartridges, into the manufacture of new HP inkjet print cartridges. It is important to note that 85% of an ink cartridge is plastic. Independently, the National Association for PET Container Resources (NAPCOR) recently released a new study that provides life cycle inventory (LCI) data for RPET and high-density polyethylene (HDPE) plastic resins. The study’s LCI report indicates that incorporating recycled PET resin in the manufacture of a package significantly reduces the environmental footprint of that package in terms of production energy required and greenhouse gas emissions. While not specifically connected or stated, we believe NAPCOR would likely support HP’s activities in reusing plastics in new supplies.

According to the company, HP combines recycled beverage bottle resin (RBR) and a suite of additives with the PET to offset lower viscosity as well as thermal and mechanical property changes. The additive package also includes chain extenders to create the desired molecular weight, impact modifiers to provide the right amount of resistance for the product drop test, and nucleating agents to restore the crystalline nature of PET. HP also adds additional glass fiber to account for the RBR portion of the recycled plastic recipe, which contains no fibers, and fibers damaged in inkjet cartridge plastic recycling. To date, HP has produced more than 555 million inkjet cartridges manufactured through the closed loop inkjet cartridge recycling process, according to data collected by the HP Imaging and Printing Group’s Research Alliance.

To produce these closed loop ink cartridges, HP is partnering with Lavergne Group, Inc. (Montreal, Canada). The plastics are recycled through patented environmental processes to use in new Original HP ink cartridges. By adding a powder additive to the recycled plastic, HP claims the resulting material has the characteristics and performance of new plastic. The amount of additive fluctuates between 3%-10%, depending on the recipe and the plastics. Quality checks assure that the resulting plastic has the proper characteristics. Lavergne has a lab that also tests the materials for quality before shipping to the client. Samples are retained in the lab for five years. HP notes that the mere fact that Lavergne has a lab puts them in another tier as other similar companies do not have this level of sophistication and investment in equipment and specialized staff. In HP's case, the resulting pellets are then shipped to one of HP's manufacturing facilities around the world (e.g., Singapore, Puerto Rico, or Ireland) to be used in the manufacture of new cartridges. Lavergne recommends that the pellets be used within a year for better quality results.

Figure 2: Lavergne Quality Assurance Laboratory



Currently, the facility is processing approximately 1 million pounds of RPET plastic per month for use in manufacturing Original HP inkjet cartridges. In the first year of the program, HP used 1.7 million pounds of Lavergne material. In one month late in 2009—during a manufacturing surge—Lavergne delivered 1.7 million pounds, representing a significant increase from the previous year.

Figure 3: Plastic Pellets to be Used Again in HP Ink Cartridges



HP and Lavergne see themselves as part of the solution for plastic recycling by using 25 million pounds of RPET bottle flake. This is equivalent to more than 1 billion plastic bottles. The companies claim that this keeps the recycling material local and up-cycles the bottle resin. There is a wide variety of plastics and they are separated by type. Some plastics are not compatible with each other and some cannot be recycled. If they end up with a plastic they are not using, it gets sold on the open market.

Figure 4: Clean RPET Bottle Shred



Closed Loop Polypropylene

In 2010, HP also added a “closed loop” process for recycled polypropylene plastics, which are different from RPET plastics. Polypropylene plastics are the ones found in cartridges, such as the HP 02 cartridges. These types of cartridges are also a growing part of HP’s ink cartridge family and have fewer technical hurdles for recycling than PET cartridges. With lessons learned from RPET, this process allows more of the cartridges returned through the Planet Partners program to be used in the production of new cartridges, while also allowing more sources of recycled plastic to be used. In the first year of making cartridges through this process, HP made 1.9 million cartridges containing closed-loop polypropylene. The company is qualifying expansion of using recycled polypropylene in additional stockkeeping units (SKUs).

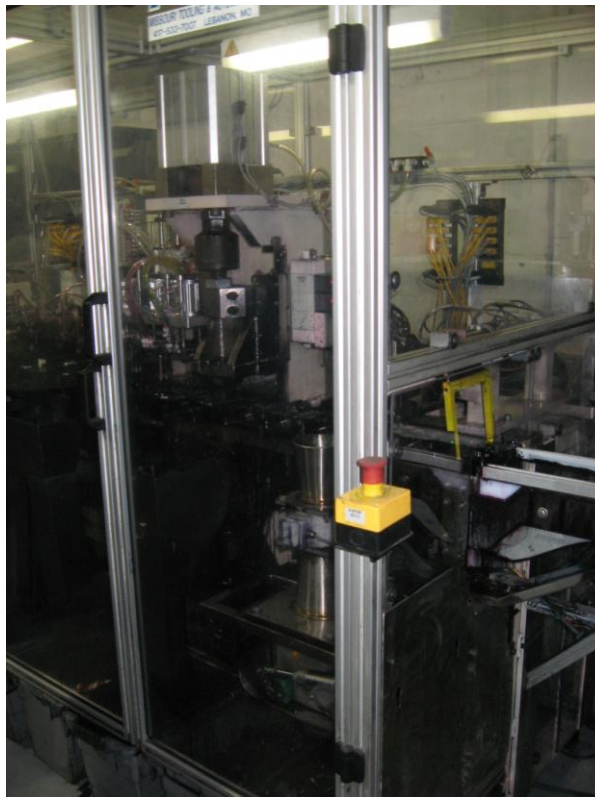
LaserJet Cartridges Post Consumer Content

HP LaserJet print cartridges also have post-consumer recycled plastics, with up to 25% or more of newly molded plastic housing made from recycled plastic. HP claims that the cartridges made from newly, molded recycled plastic resins still meet HP’s high-performance standards. Since 1992, HP has reduced the average number of plastic resins used in HP LaserJet monochrome print cartridges by more than half and the average number of component parts by more than a third, which improves the recyclability of HP LaserJet print cartridges.

Cartridge Disassembly Prototype Machine

HP has also worked on another development: a cartridge disassembly prototype machine that separates the plastic and metal materials of the returned cartridges more effectively, resulting in more re-usable content. In a slower and more expensive process, the machine carefully takes apart the ink cartridge without crushing any of the components (something that currently happens in most processes).

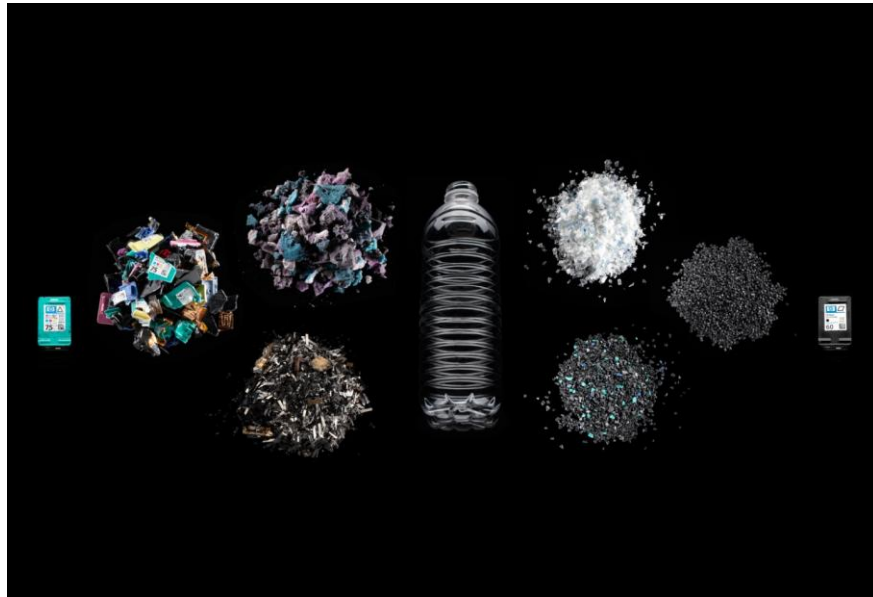
Essentially, the new process mimics the steps used to create a new cartridge only in reverse. For example, the sponges inside the cartridge are removed intact, which makes it easier to use them in other processes. The sponges are currently incinerated, but other options are being considered. For example, any ink remaining in the sponge could be squeezed out. Any residual ink in the cartridge and sponge can be captured easier with this process, as well. Lavergne and HP are investigating possible uses for the recovered ink, such as box printing or other lower specification printing applications.

Figure 5: Prototype Disassembling Machine

The new prototype machine, developed by Missouri Tooling and Automation (www.mtautomation.com) but the design is owned by HP, is credited with a 50% plastic recovery improvement over the old process. In other words, by using this disassembly process, 90% of the plastics can be recovered while only 60% can be recovered in the current process.

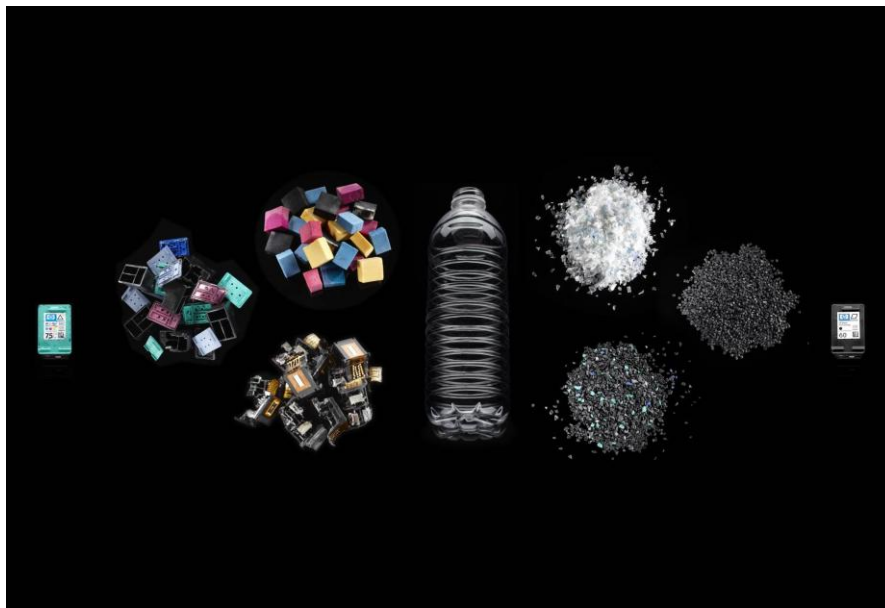
The returned cartridges have to be sorted in both processes, but that is where the similarities end. In the current process, the cartridges are then shredded and separated before they go to another facility for plastic refinement and rinsing to achieve a clean PET shred. HP claims the pilot process alleviates many steps by only having to disassemble and rinse to get clean PET for recycling. Once the shred has been recovered, it is re-compounded into new pellets, which are sent to HP's manufacturing facilities for use in new cartridges. The new process would also minimize the amount of cartridge transport around the world with a more localized approach to processing the empty cartridges—essentially, giving the production process a smaller carbon footprint. While HP continues to investigate the disassembly innovation, the current process involves initial recycling processes at centralized recycling facilities in North America (Sims, Nashville, TN) and through Produkte Durch Recycling (PDR) in Germany, followed by contaminant removal from the plastic stream at Butler-MacDonald (www.butlermacdonald.com), and Lavergne re-compounding the recovered HP plastic with recycled bottle resin for use in Original HP inkjet cartridges.

Figure 6: Plastic in Current Process



Note: The shredded materials are more difficult to use in recycling processes.

Figure 7: Plastics in Pilot Process



Note: The pilot disassembling process results in materials that are more intact, making them easier to use in other processes.

Printers

By 2011, HP has pledged to use a total of 100 million pounds of recycled plastic, cumulatively from 2007, in printing products. So far, current products made from recycled content include:

- **HP Deskjet D2600 Printer:** Made from 50% recycled materials and requires 30% less energy than the previous model
- **HP Deskjet F4400 Printer:** Made from 20% recycled materials and helps customers decrease energy consumption more than 55% than the previous model
- **HP Photosmart A640 Compact Photo Printer:** Built with more than 32% of the printer's body created from recycled plastic material and ships in a reusable tote for reduced packaging waste

Lavergne Group

Since 1986, the Lavergne Group has manufactured engineering resins and environmental solutions. The company was involved in finding the right mix of recycled HP plastic and recycled bottled resin as well as identifying the appropriate additives to meet HP's quality standards. Lavergne has researched material recovery as well as disassembly processes to develop end of life recycling. With tremendous growth, the company now operates seven days a week, 24 hours a day.

The company is also involved with re-engineering recovered plastics. The recovered plastics have the property values of virgin equivalents, which enables higher use of recycled plastic. To accomplish this, Lavergne adds an additive to bring the plastics back to original levels. According to Lavergne, there is no limit to the number of times since the additive is the ingredient that brings the plastic back to its original state. In testing, however, the company has seen plastic used at least six times over and at seven times the product is still testing at 100%. Beyond that, the re-engineered plastic has achieved cleanliness levels for FDA approval.

While Lavergne has a close relationship with HP, the company has relationships with other organizations in different industries, including automotive, appliance, construction, electronic, and office furniture. HP is about one-fifth of Lavergne's business. Primary markets for Lavergne include North America and Europe, but the company ships all over the world. About 97% of Lavergne's business is out of Canada, where they are shipping 30 to 35 containers a month (one container can hold 25,600 kilos). By the end of 2010 or early 2011, however, Lavergne plans to open a facility in Vietnam to be closer to the markets that they participate in. Even though Lavergne does not have operations in the U.S., it covers the North American market with its Montreal facility.

Design for Environment (DfE)

HP Energy Efficient Monochrome Toner

One of HP's more recent developments in monochrome toner is its Enhanced Low-melt Toner Technology which has a lower melting point, 10°C lower. The new monochrome toner formulation was specially developed and created for these printing systems to deliver print quality consistency at faster print speeds (according to HP marketing materials). The company claims that this uses up to 35% less energy for every page. The temperature at which the toner begins to soften is somewhat lower than previous generations, so it does not need to get as hot in order to fuse. The company claims that the toner requires 15% less energy to reach fusing temperature. Once the toner is softened, it "spreads" more easily than previous generations.

Table 1: HP LaserJet Printers that Use Low Melt Toner

P4014, P415, P4515	P3005	M3027mfp	P3015
4200, 4300	4345mfp, M4345mfp	4250, 4350, 4240	5200, 5200LE
M5025mfp, M5035mfp	P1005, P1006, P1007, P1008	P1505	M1120mfp
M1522mfp	1160	1320	3390
P2015	P2035	P2055	2300L, 2300
2410	2420	2430	

HP Paper Products

The following are key facts about HP's paper products:

- All of HP Everyday Papers are certified through the Sustainable Forestry Initiative (SFI) or Forest Stewardship Council (FSC).
- HP Office Recycled Paper has 30% recycled fiber and uses ColorLok technology to help reduce environmental impact but maintain print quality, according to HP.
- HP Photo Paper, including wide format paper, is procured through environmentally-preferred, certified suppliers from responsibly managed forests.
- HP Everyday Photo Paper:
 - is recyclable through municipal programs that recycle mixed paper, where available
 - is FSC certified; packaging is made with 100% recycled content with a minimum of 35% post consumer recycled content
 - moved printed in-box instructions online, saving 11 tons per year of paper for select photo products.

North America Packaging Reduction

HP inkjet single cartridge packaging was reduced by more than 40% of its weight in 2009. HP claims that this will eliminate 1.2 million pounds of paperboard as well as 0.5 million pounds of in-box material annually. The packaging reductions allow for 90%-110% more products to ship in an individual truckload, and these reductions translate to a total benefit of approximately 1.7 million pounds of CO₂ equivalents each year.

In 2007, HP's redesigned ink and toner cartridge packaging reduced greenhouse gas emissions by 37 million pounds for that year. Other benefits of smaller packaging are that more products can be displayed in the same amount of space. Due to specific requirements, the warehouse clubs cannot move to this new type of packaging. The clubs still use the #5 plastic; Durafold; or clamshell, which is now 30% recycled plastic. Since July 2004, this practice has resulted in a 10,000 ton reduction of materials used in inkjet packages.

Industry Impact

Hewlett-Packard strives to be the company that sets the bar for the rest of the tech industry in regards to environmentalism. The company continually works at this through all levels of the organization, which is evident in product design and end of life practices for products. Other companies are also working at being good environmental stewards, but are not as fully-evolved as HP is in this area. HP has made this a priority and, as a result, dedicates staff, money, and resources to this endeavor. Not all companies are in a position to do this to the degree HP has, but now that HP has laid the groundwork and has shown on a grand scale that it is possible to use recycled plastics again in new supplies and other products, other companies may follow the same path.

Another major company, Xerox, has also been very active in its supplies return program: Green World Alliance. In the Xerox program, the returned products are cleaned, inspected, and then remanufactured or recycled. According to Xerox statistics, "remanufactured cartridges, containing an average of 90% reused/recycled parts, are built and tested to the same performance specifications as new products. Waste toners that qualify for reuse may account for 25% of the weight of new toner, without compromising toner functionality. Reusing waste toner saves several million dollars in raw-material costs each year."

While the use of recycled plastics does not cover all its supplies products, HP is targeting the largest families of its ink products for the biggest impact and return. It is assumed that HP will plan to continue adding products that can be recycled to cover more of its line. Although it is not specifically stated, Lavergne's comments support this idea as they are expecting dramatic growth in 2010. HP's messaging follows the line that the environment is important and should be important to everyone. This message is starting to catch on as HP's Planet Partners program gains more support from customers to return their empty ink and toner cartridges to Staples or via HP's available free mail-in system. One of the issues with returning cartridges to Staples is that it is not always the most convenient since the empty cartridges need to be physically brought into the store to collect the \$2.00 credit.

Another benefit of the Planet Partners program for HP, which may or may not be intentional, is that it brings more of its empties off the street and away from remanufacturers. From InfoTrends' communications with the remanufacturing industry, this is negatively impacting their business by having less access to empty cores (cartridges), a critical component to their business. For some cartridges, availability is strained, which is causing the price of empties to increase dramatically.

InfoTrends' Opinion

While most would agree, these programs are a good thing despite the significant investment needed to develop them. Progress has been made, but there is more to be done. There are more products to collect, more products to recycle and reuse, and more regions to cover. While HP has made the environment a constant and consistent message company-wide, this message continually needs to be emphasized to customers to encourage more returns. To make this possible, this message should be a part of any and all marketing to customers. For example, HP has new television and prints advertising that emphasizes HP inks are superior to remanufactured or compatible products. Why not include a tagline to return empty cartridges to HP for recycling? Surely this would be a positive message that would resonate with customers. Many companies are gaining ground with their environmental and sustainability programs, and customers are responding. The trick is to now make returning products, whether it is supplies or something else, a simple process so it becomes an ingrained behavior.

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