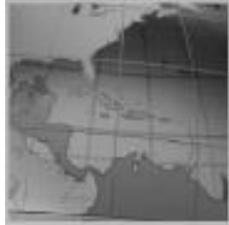


Primary Research



August 2011

2011 U.S. Supplies Recycling Study

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Executive Summary

InfoTrends spoke with 6 major printer OEMs, 9 remanufacturers, 4 brokers, in the United States about their supplies collection and recycling programs for ink and toner cartridges. The information below is based on answers from interviews for this study.

Key findings from the survey:

- 20% of toner cartridges and 40% of ink cartridges collected by remanufacturers are unusable.
- To successfully remanufacture one cartridge, remanufacturers need to collect 1.1 virgin toner cartridges and 1.2 virgin inkjet cartridges while it takes 1.43 non-virgin inkjet cartridges and 1.35 non-virgin toner cartridges.
- 81% of toner cartridges and 90% of ink cartridges are remanufactured only one time.
- 94% of remanufactured toner cartridges and 92% of remanufactured ink cartridges sold will ultimately be thrown away.
- Most remanufacturers still do not want their own cartridges back but are more willing to take them back because they know how the cartridge was previously processed.
- 65% of unusable toner cartridges and replacement parts and 40% of the unusable ink cartridges and replacement parts go to landfill.
- 20% of collected but unusable toner cartridges/parts and 25% of collected but unusable ink cartridges/parts are recycled into new products or raw materials
- 15% of collected but unusable toner cartridges/parts and 35% of collected but unusable ink cartridges/parts go to waste to energy
- Large remanufacturers routinely replace the components and will re-use the hulk to the extent that their own cores come back to them.
- Toner parts replaced most often include the drums, PCRs, wiper blades, and magnetic sleeves. For inkjet, the sponge is sometimes replaced. Smaller remanufacturers rarely replace more than the drum and often allow the replacement drum to run several cycles. As a result, the smaller remanufacturers are much more focused on virgin hulks than are the large remanufacturers.
- Significant increase in plastics grinding/recycling and waste to energy processing among the top laser and inkjet remanufacturers
- Empties from brokers are certified and ready to be remanufactured while the remanufacturer collection programs require more of sorting
- Remanufacturers with their own brokers rely on these captive brokers for 90% - 99% of their empties.
- Often, smaller remanufacturers purchase about 40% of their cartridges from outside brokers.
- Public reporting of environmental performance has become more available from the remanufacturers and OEMs that we surveyed. Nevertheless, some of the OEMs were a bit more forthcoming. HP, Lexmark, Canon, and Xerox in particular shared more information than other OEMs about their programs and what happens to cartridges after they are collected. Based on information available on the Internet, HP is still a clear leader in this regard but other companies, including remanufacturers, are improving.

Glossary

While reviewing this document, it may be helpful to keep the following definitions in mind:

- **Empty:** A used cartridge that might be suitable for re-use or recycling
- **Extra - Wrong Vendor:** Cartridges from vendors that the remanufacturers do not accept
- **Final Disposition:** What happens to a cartridge at the end of its life (sent to landfill, recycled, etc.)
- **Hulk:** An empty cartridge of any kind
- **Non-Virgin Empty:** An empty cartridge that has previously been remanufactured
 - Bad Non-Virgin Empty: A non-virgin empty that cannot be successfully remanufactured or one for which there is no market
 - Good non-Virgin Empty: A non-virgin empty that can successfully be remanufactured
- **Recycling:** Crushing or melting components for use in other products or industries
- **Reman:** Remanufactured cartridge or remanufacturer, depending on context
- **Reman Recycling Ratio:** Share of reman waste that is recycled rather than sent to a landfill or incinerator
- **Remanufacturing:** The practice of cleaning, servicing, refilling, and re-using cartridges
- **Virgin Empty:** An empty cartridge that has not been remanufactured
 - Bad Virgin Empty: A virgin empty that cannot be remanufactured or one for which there is no market
 - Good Virgin Empty: A virgin empty that can successfully be remanufactured

Introduction

Over the past several months, InfoTrends spoke with numerous players in the supplies industry about their supplies collection programs, including 6 major printer OEMs, 9 remanufacturers, and 4 brokers. It is clear that supplies recycling holds varying degrees of importance based on a company's position in the market. OEMs collect empty cartridges in an effort to be environmentally responsible, and remanufacturers and brokers collect empty cartridges to be sold or remanufactured in the aftermarket.

Remanufacturers and brokers continue to seek new ways to collect cartridges more efficiently—not only because empties are the lifeblood of their businesses, but also because they want to be viewed as environmentally responsible. Cartridge collection, post collection and cartridge end-of-life are important for all that were interviewed in this study; however, the degree of effectiveness in each area varied widely. The collection and recycling issue is a topic of interest for all parties involved. The goal of this study was to obtain an understanding about current practices and program evolutions. Below are the findings from this InfoTrends study.

Remanufacturing Industry

The U.S. has historically placed less emphasis on developing environmental legislation concerning hardware and supplies. However, as more companies in this market become ISO 14001 certified, companies will be forced to do more reporting to maintain certification. The U.S.-based remanufacturers and brokers that we spoke to are offering more information about what they do with unusable empties and their disposal processes. In addition, more companies are planning to publish sustainability reports as a

service to their customers as well as to fulfill requirements for various environmental certifications including ISO 14001.

Remanufacturers = Brokers?

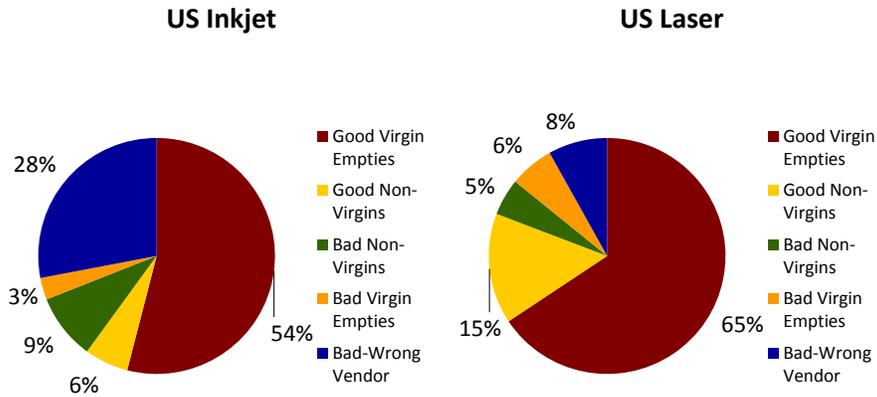
Most of the large remanufacturers have captive brokers (some home-grown, some acquired). Most remanufacturers developed their own collection programs long ago, and supplies from brokers often met the balance of their needs. These organizations grew and had excess cartridges. This led to more transactions until the organisation became a full-fledged broker with its own collection programs and hierarchy of selling and buying in the market. Remanufacturers with their own brokers rely on these captive brokers for 90% - 99% of their empties. Often, smaller remanufacturers purchase about 40% of their cartridges from outside brokers.

Nearly all remanufacturers have some form of self-collection capability. Only a few remanufacturers, usually smaller companies, source exclusively from brokers, as purchasing cartridges from brokers is generally more expensive than collecting their own empties. One advantage of dealing with brokers that was explained is that the empties from brokers are certified and ready to be remanufactured while the remanufacturer collection programs require a fair bit of sorting before the cartridges can be used. In addition, buying from brokers provides the remanufacturers with exactly what they need while remanufacturer collection programs will usually net cartridges they do not need or want, forcing them to either sell them or dispose of them at additional cost.

The following charts present the findings from the study. The information is based on answers from interviews for this study, as well as information InfoTrends garnered previously, and data points obtained from key vendors.

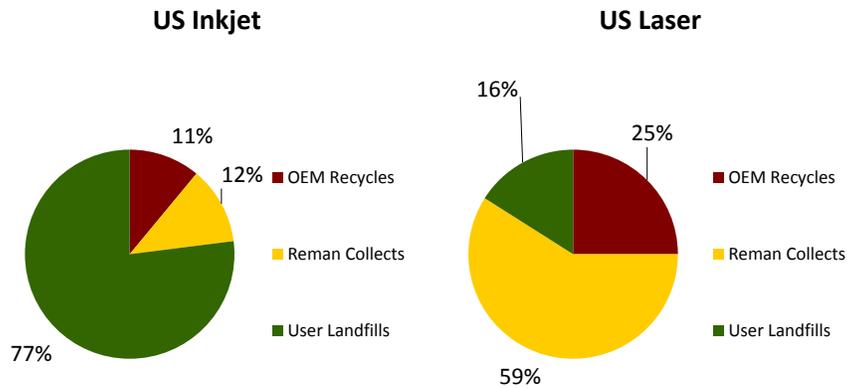
- We estimate that 20% of toner cartridges collected are unusable, while this number jumps to 40% for inkjet. Various factors are at play. The toner cartridges are subject to damage during shipping and handling as well as some breakage during processing. Toner cartridges from very old printers or other items are just not remanufactured (e.g., Xerox toner kits).
- For inkjet, 40% of the cartridges that remanufacturers collect are not re-used because they are Canon or Epson brands, or some other tank that is generally not remanufactured. Staples pays \$2 for empty cartridges including Epson and Canon ink tanks because they have become more valuable for remanufacturing after the landmark ITC ruling. Inkjets also have more issues with drying out (affecting the nozzles and internal electronics)
- To successfully remanufacture one cartridge, remanufacturers need to collect 1.1 virgin toner cartridges and 1.2 virgin inkjet cartridges. Although they are not as desirable, remanufacturers often collect non-virgins as well, and this changes the metrics. Only 19% of remanufactured cartridges are from non-virgin toner cartridges. Some are damaged or have a number of foreign components, making them less reliable for remanufacturing. We estimate that 1.35 non-virgin cartridges are required to remanufacture one toner cartridge. For inkjet, only 10% of remanufactured cartridges are from non-virgin cartridges, so 1.43 non-virgin cartridges are required to remanufacture one toner cartridge.
- Despite the efforts of remanufacturers, they are bound to collect some products that they do not want or need. In terms of laser products, these companies receive toner kits, bottles, and cartridges that are not remanufactured. For inkjet, they receive a lot of cartridges that are damaged or dried out and consequently cannot be remanufactured or refilled with any confidence in quality.

Figure 1: Supplies Collection Distribution



- Overall, the remanufacturers and brokers collect about 59% of the OEM virgin toner cartridges in the U.S.
- For inkjet, the percentages are much lower, with remanufacturers and brokers collecting only about 12% of OEM virgin cartridges in the U.S.
- Consumers throw out the majority of inkjet cartridges (77%), but only 16% of laser cartridges because more people understand that toner cartridges have inherent value.
- When a remanufacturer collects a virgin empty, that remanufacturer takes over ownership of that empty. Technically, remanufacturers have ownership of their non-virgins (in the field) that they remanufacture as well as the virgins that they collect.

Figure 2: Laser and Inkjet Collections in the U.S.



**Numbers are pulled down because not all inkjet OEM collect their cartridges and because there is a lack of demand for used tanks.*

- In the past, many smaller remanufacturers would re-use non-virgins several times to leverage the expensive new drum that was replaced. For remanufacturers to be profitable, the empty returned cartridge would need to be used multiple times.
- According to our research, a monochrome toner core can be used three to four times on average if the components are replaced. In practice, however, for both toner and inkjet, the average number of times that a core is remanufactured is only slightly more than once given that collections remain focused on virgin empties. Offering local pickup and delivery, some remanufacturers offer hands-on customer service while also collecting empties to sustain their businesses. Nevertheless, the industry has since consolidated and there are now several large manufacturers that supply these small remanufacturers. As a result, there are far fewer truly local remanufacturers, as most local remanufacturers now outsource their products and no

longer remanufacture directly. Additionally, the unit price of a new aftermarket drum has plummeted from \$50 each when they were first introduced in the mid-1990's to about \$3 per unit today.

As a result, remanufacturers have shifted to using virgins rather than using an empty cartridge multiple times. This is mainly due to quality considerations, as quality degrades after a cartridge is used multiple times. As well, remanufacturers use to collect and reuse their expensive OPC drums which they installed in their cartridges. Today, those drums are much less expensive and do not need to be collected to amortize the value over several cycles. Inkjets have a very high failure rate for non-virgins, in excess of 30%, due to damage and dry out issues. The following tables show the summary of disbursement of collected cartridges for laser and inkjet cartridges respectively.

Table 1: Disbursement of Collected Laser Cartridges

	Virgins	First Cycle Reman	Final Cycle Reman
OEM Collects	25%	0%	0%*
User Landfills**	16%	74%	82%
Remanufacturer Collects:	59%	26%	18%
Remanufacture	54%	19%	0%
Landfill	4%	4%	12%
Waste to Energy	1%	1%	3%
Recycle	1%	1%	4%
Total	100%	100%	100%

*No cartridge is remanufactured indefinitely

**Does not count the unknown number sent by Staples to Close the Loop

Table 2: Disbursement of Collected Inkjet Cartridges

	Virgins	First Cycle Reman	Final Cycle Reman
OEM Collects	11%	0%	0%*
User Landfills**	77%	86%	69%
Remanufacturer Collects:	12%	14%	31%
Remanufacture	10.2%	10.0%	0.0%
Landfill	0.7%	1.7%	12.3%
Waste to Energy	0.9%	2.3%	16.1%
Recycle	0.1%	0.3%	2.3%
Total	100%	100%	100%

*No cartridge is remanufactured indefinitely

**Does not count the unknown number sent by Staples to Close the Loop

Brokers

The two main categories of brokers are captive (owned by a remanufacturer) and independent. Both operate very much the same in the marketplace. The primary goal of the two types of brokers is to sell the empty cartridges they receive to remanufacturers that will refill and refurbish the cartridges to sell them again. Captive brokers exist to supply their parent remanufacturers, but they also buy and sell as profit centres. The

European market is more fragmented than the US market and some remanufacturers have their own collection program but many rely on independent broker.

Table 3: Sampling of Remanufacturers that have Brokering Capabilities

Remanufacturer	Broker
Clover	Clover Environmental Solutions (CES)*
Image Craft	TonerBuyer.com
InkCycle	R & R Program
Legacy Imaging	Collect, Inc.
Turbon	Core Collection Programs
West Point Products	West Point Products Recycling Program

*Clover Environmental Solutions (CES) owns several brokers including the acquisition of ERS (US), OPRA (US), and ReclaimIT (UK). Clover also has a strategic partnership with Redeem plc, based in Scotland and K2.

For the broker model to work, brokers offer incentives or rebates on cartridges they are trying to obtain. Generally, they publish a price list for all the cartridges they want to buy which often changes monthly. Cartridges, typically newer SKUs, are in higher demand and garner higher prices, while older cartridges carry smaller rebates. Non-virgin cartridges are generally priced substantially lower (or there is no price at all, as they are generally considered undesirable). Customers purchasing remanufactured cartridges will typically find that the value of empty cartridges is low, as some collection programs accept OEM cartridges but will not take back used remanufactured cartridges. The aftermarket customarily will only pay for what they want, and non-virgin cartridges are not in high demand.

Remanufacturers and brokers often sell products to each other to equalize supply and demand or to get rid of sub-par products. Overall, it is an efficient, but speculative market. While this is difficult to quantify, it appears that there is a significant net shipment of empties from Europe to the United States. Excess and damaged cartridges, as well as those that have been remanufactured previously (non-virgins), may be sold several times to successively lower-quality remanufacturers before ultimately being discarded rather than recycled. Asian remanufacturers have also been known to use any cartridge, virgin or not.

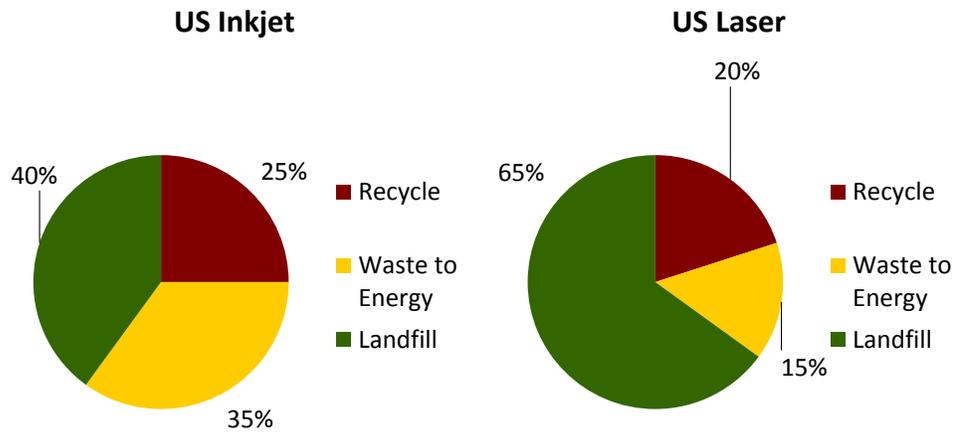
Virgin vs. Non-Virgin Cartridges

In the U.S. market, about 76% of the empty toner cartridges available on the market are virgins. Most of the non-virgins are thrown away, but a small percentage is collected by remanufacturers. About 16% all virgin toner cartridges are thrown away, and about 59% are collected by remanufacturers. The rest go back to the OEMs. OEMs collect more toner cartridges than ink cartridges because more OEMs have programs for toner cartridge collections than for inkjet cartridges. Many new OEM toner cartridges are shipped with labels in the box for users to send back the empty cartridge after installing the new cartridge. OEMs also rely on their websites to help users with program information and print labels if the label is not present in the box.

Collecting inkjet cartridges is much more difficult than collecting toner cartridges. We suspect that users have less of an aversion to disposing of inkjet cartridges because of their relatively smaller size. Of all the virgin empties in the U.S., the majority is thrown away by users. A very small percentage of these empties are collected by the OEM, and a larger share is collected by the remanufacturing industry.

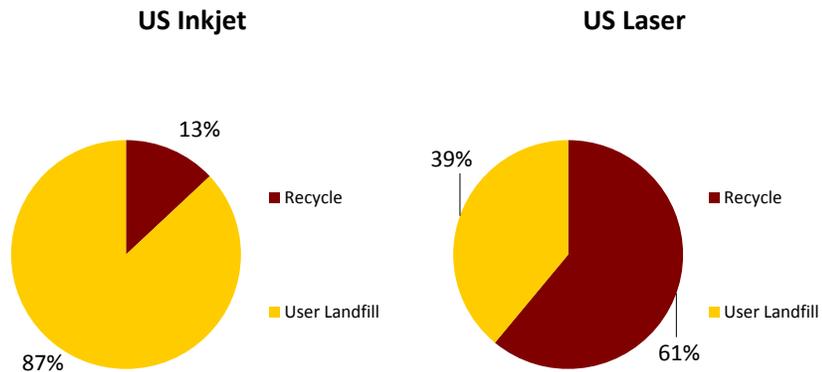
According to InfoTrends estimates, shown in figure 4, 65% of laser cartridge waste is land filled, 35% that is not landfilled, 20% is recycled and 15% goes to waste to energy. For inkjet, 40% of inkjet cartridge waste is land filled, 35% is recycled and 25% goes to waste to energy. Some non-virgin cartridges are collected by the remanufacturing industry. Whether laser or inkjet, the OEMs do not disclose exact percentage collected. Most OEMs claim nothing goes to landfill. There are a few OEMs that have small amounts that do end up in the landfills usually because the material cannot be recycled or reused. In the end, 94% of remanufactured laser cartridges and 92% of remanufactured inkjet cartridges ultimately end up in landfill.

Figure 3: What Happens to toner and inkjet cartridges/components that can't be used or sold (Industry Average)



While some of the waste that remanufacturers generate (mainly damaged or bad cartridges) is recycled, many remanufacturers do not place a lot of emphasis on ensuring that this happens. Remanufacturers point out that their environmental benefit is re-use. For laser and inkjet cartridges, there is a need for constant replenishment of the system because few cartridges are remanufactured more than once. The following Figure shows what happens to virgin ink and laser cartridges not collected by remanufacturers.

Figure 4: Share of Virgin Empty Laser and Inkjet Cartridges that End Up in Landfill or OEM Recycles



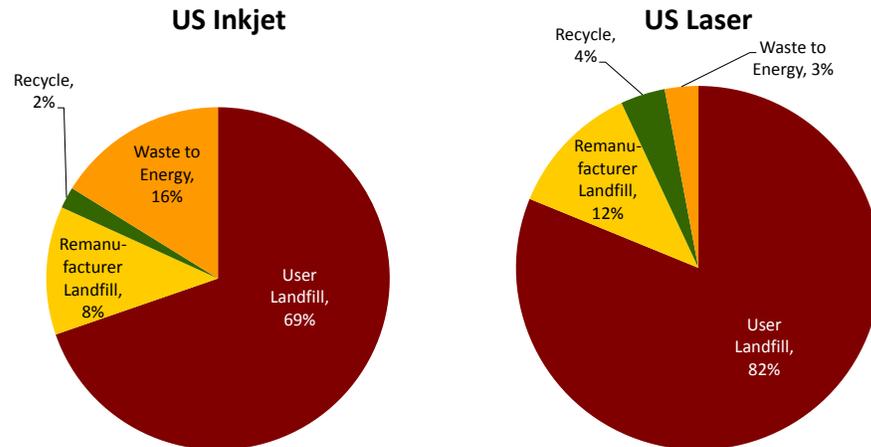
The Figure below outlines what happens to remanufactured laser cartridges. InfoTrends' research found that the chance of a remanufactured cartridge ending up in a landfill after the first remanufacturing cycle is high: 94% of remanufactured toner and 92% of remanufactured inkjet cartridges are thrown away. This is because remanufacturers have

such a strong preference for virgin empties and remanufacturers generally gear their programs to increase their collections of virgin empties. The non-virgins that are collected have a lower likelihood of being successfully remanufactured. The study suggests that non-virgins collected will often be resold, and sometimes resold several times, at lower values. Eventually, many will become scrap and will likely be land filled or recycled. The following Figures show what happens to virgin toner cartridge empties that are not collected by remanufacturers.

Remanufacturers may collect some products that they do not want. For laser products, they may receive toner kits, bottles, and cartridges that are not remanufactured. For inkjet, they receive cartridges that are damaged or dried out and consequently cannot be remanufactured or refilled with any confidence in quality.

While U.S. remanufacturers state that they do not wish to landfill their remanufacturing and cartridge waste, this is sometimes the only cost-effective option for them. As shown in the charts below, remanufacturers recycle or landfill products that they cannot use, but users landfill much more often. The pie charts below detail the final disposition of remanufactured laser and inkjet cartridges.

Figure 5: Share of Remanufactured Laser and Inkjet Cartridges that go to Landfill that are not remanufacturable



Recycling activities by the remanufacturer also varies by size of the remanufacturer. Since 2007, there has been a significant shift among the very largest remanufacturers to find alternatives to landfill and more recycling of plastics and metals and waste to energy. Smaller remanufacturers continue to mainly landfill what they cannot use or sell.

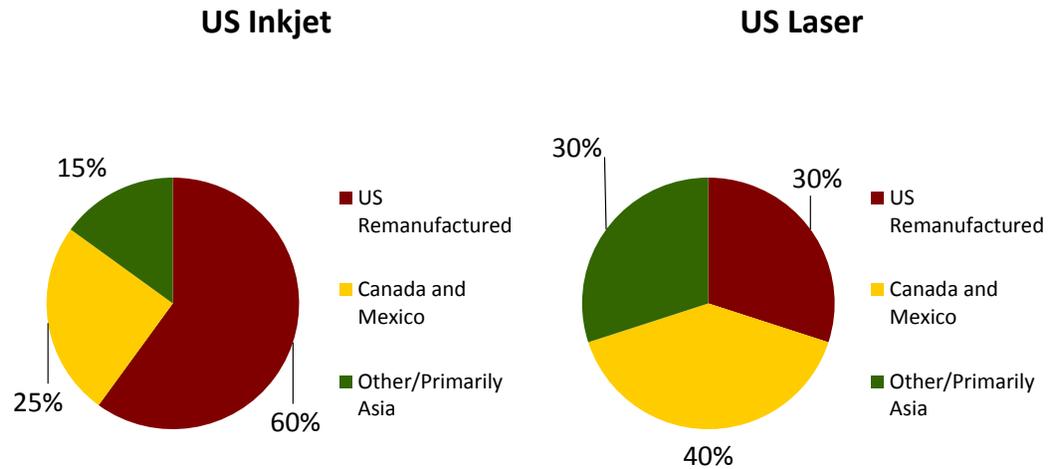
Finally, OEMs are able to collect about 20% of laser cartridges and 8% of integrated inkjet cartridges. Most of the material is recycled, but it is difficult to avoid some energy recovery or incineration.

Remanufacturing Location: Domestic or Import?

Large differences exist between where remanufacturing is done for laser and inkjet cartridges. The study suggests that a high percentage of remanufactured laser cartridges are remanufactured outside the United States while for inkjet most respondents felt that the majority of inkjet remanufacturing remained in North America including the US, Canada, and Mexico. For inkjet, estimates are as high as 90% that are remanufactured in North America. For laser and inkjet, nearly all US remanufactured cartridges use U.S.-

sourced cores. The main reasons are that it is too expensive and inefficient to ship empty cartridges and this would also have a negative impact time to market, product planning and availability and perhaps on the carbon footprint. In addition, the largest remanufacturers have facilities in North America so it makes sense for activities to take place at these locations.

Figure 6: Source of Remanufactured Laser and Inkjet Cartridges Consumed in the US



Collection Methods: Brokers and Remanufacturer/Brokers

Remanufacturers and brokers use a wide variety of collection methods and have various programs for different targets. Some of the more common venues for collection of empties are non-profit organizations, schools, churches, and businesses. Some will also use their own resellers and suppliers to collect empties. Store brand resellers have been very effective at boosting collections in the United States. Some also have a points system through which consumers can trade in points for products (www.fundingfactory.com). For example, schools that collect empty cartridges can earn points toward new computers or printers for the school. Some broker companies offer the option to donate any rebates earned from cartridges to a favorite charity (www.recycle4charity.com).

One of the biggest changes that have occurred is that Staples now collects all ink and toner cartridges. Previously, Staples would only offer the \$3.00 credit on the integrated cartridges from HP, Dell, and Lexmark. After the ITC ruling was finalized, it was realized the empty Epson tanks now had value for remanufacturing and Staples started taking back all inkjet cartridges and tanks with customers receiving the \$2.00 credit. For customers to participate in the program, they must be a Staples Rewards member and also cannot bring in more than 10 cartridges a month. Staples will recycle additional cartridges but rewards will only be issued for 10 per calendar month per customer. The ink recycling reward arrives each month by email, separate from the standard Staples Rewards statement. The HP cartridges collected by Staples are sent back to HP for environmental processing. Other brand cartridges are believed to be handled in a variety of ways including giving certain inkjet cartridges to its private label partner and others are handled in an environmentally friendly manner. With Staples as its retail partner, HP has decided to forego the envelopes they had been putting in inkjet cartridge packages for customers to send them back to HP. Envelopes for returning inkjet cartridges are still available directly from HP's website but customers must go to the site to request them.

Some remanufacturers and brokers have established drop-off locations and try to work with non-profit organizations such as churches and schools. These collection practices can be viewed as an economical way to collect empties from organizations that can draw empties from a wide range of people. The downside of this method is that collections can yield a lot of empties that are not wanted or damaged in some way. InfoTrends estimates that bad cartridge collections are up due to user and channel demands despite efforts of collectors to limit unwanted cartridges.

In addition, some still have door-to-door routes for collecting empty cartridges though this can be a very expensive way to collect. While individual collections are used by brokers and manufacturers, bulk collections are preferred for cartridges from customers that generate a lot of empties. Cartridges that are in high demand but low supply will have a better incentive, usually in the form of cash (which is most preferred by end-users). Generally speaking, remanufacturers and brokers are not as protective of the details of their programs as they once were, and are more willing to reveal their partners and methods. The reason for this change has more to do with customers' greater interest in the environment and how companies they deal with their environmental activities.

Broker and Remanufacturer Public Environmental Reporting

As environmental interest grows from customers, more and more supplies companies have acknowledged that they need to be more environmentally responsible. As a result, over the past few years, many companies have become certified through the ISO 14001 standard which was developed for companies to provide a practical toolbox to assist in the implementation of actions supportive to sustainable development. In addition, the company has certified that they have systems that minimize harmful effects on the environment caused by its activities. This certification requires the company to demonstrate their environmental responsible capabilities and continue to confirm to the requirement by continuously improving its environmental processes. The Table below lists some of the supplies relevant companies that can claim the ISO 14001 certification. This list has grown over the past few years and continues to grow.

Table 4: Supplies Related Companies with ISO 14001:2004 Certification

Brother	Kyocera Mita
Canon	MSE
Clover	Okidata
Dell	Ricoh
Epson	Sharp
Greentec	Turbon
Hewlett-Packard	Xerox

One of the most efficient ways for companies to share how and what they are doing in terms of environmental processes is through their website. Some companies also produce citizenship/sustainability reports that tout companies' activities in a variety of areas including environmental management in addition to other areas. The list below contains quotes from companies' websites or reports that have relevant details about the company's environmental activities for supplies.

- **Astro Inkjet** partners with local recycling initiatives around Massachusetts to properly collect and recycled the cardboard containers used to initially package new toner cartridges. The company also encourages customers to give them the

plastic bag that holds new toner cartridges. Astro fills them with recycled newspaper, heat-seals them, and uses them as packaging for shipping their cartridges.

- **Castle Ink** announced a partnership with Recycle For Life, a recycling program for empty ink cartridges and laser toner. Empty cartridges can be sent to Recycle For Life in exchange for cash, or a donation to the charity of choice.
- **Clover Technologies Group** claims to be the world's largest collector and recycler of empty ink and toner cartridges, cell phones, PDAs, and small electronics, with more than 44 million units collected in 2010. Clover is ISO 14001 certified and claims to have the industry's only grinding operation focused on the reclamation of raw materials from end-of-life laser toner cartridges. Clover operates under a Zero-Waste-to-Landfill Policy to ensure that materials collected for remanufacturing will not go to landfill.

Clover evaluates every empty cartridge, small electronic or printer component that is received; first for remanufacturing and second for material recovery through recycling. Collections that can be remanufactured by Clover will be disassembled so that as many components as possible can be reused. If these collected materials cannot be remanufactured, they will not be sent to landfill. If recycling is not feasible, the collected materials will be sent to its waste to energy partner to be used as a renewable power source. If collected materials must be recycled, useful products are produced that substitute for virgin resources.

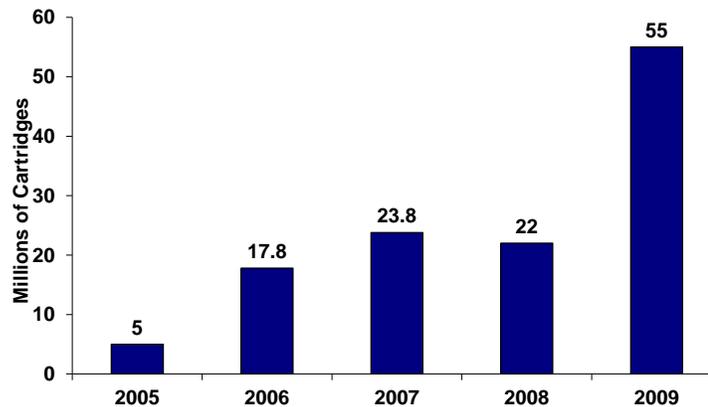
In April 2010, Golden Gate Capital acquired Clover Technologies Group and **West Point Products**. Although Clover and West Point are becoming more integrated, there are some operations that are still distinct. Annually, West Point Products remanufactures more than 1,000,000 toner cartridges West Point Products will only send to landfills the same items that would be sent from general household waste. Boxes used for products are made with more than 40% recycled material. Packing paper contains over 20% recycled materials. Primary Charging Rollers are sent to a third party for recoating and reuse by other entities. Toner bottles are delivered to a recycler for re-use and recycling.

- **Electronic Manufacturers Recycling Management Company, LLC (MRM)** is a joint venture by Panasonic Corporation of North America, Sharp Electronics Corporation, and Toshiba America Consumer Products, LLC, and operates a national take-back and recycling program that is open to all electronics manufacturers. The company has two avenues of recycling printing supplies. They have a couple of vendors who will select ones that they can reuse and then they dismantle and recycle the damaged, obsolete, and out-dated ones. January through November 2010, MRM had recycled 29,861,000 pounds of electronic waste.
- **Green Project, Inc.** estimates that over 90% of all ink and toner cartridges are suitable for remanufacturing and less than 20% of all cartridges are being recycled. Over 30% of currently purchased ink and toner cartridges are being remanufactured. All components of empties that are not graded acceptable for remanufacturing are disassembled and recycled as reusable scrap. Shipping boxes are made with 90% recycled post-consumer fiber. Packing peanuts are earth friendly, starch-based and biodegradable. They will dissolve in water, in a compost setting or landfill.
- **grenk**, a zero-landfill policy ink and toner cartridge line, is available through **InkCycle**. grenk users can calculate the exact amount of e-waste that the user has prevented from going into a landfill through the CarbonNeutronics Index software program. The first water filtration process that cleans the water on-side before it re-enters the environment. InkCycle is committed reducing waste in landfills around the globe. Technology experts inspect every defected toner cartridge to determine salvageable parts. Working materials are then reused in

InkCycle's manufacturing process. Defective parts are sent to recyclers for use in other materials.

- **LMI Brand Imaging Supplies** conserves nature's resources by reusing non-wearing plastic shells and metal components from spent OEM cartridges. LMI's Remanufactured Toner Cartridges contain a minimum of 45% post-consumer recycled content.
- **Staples** is one of the world's largest recyclers of ink and toner cartridges. In 2010, Staples collected nearly 55 million ink and toner cartridges in the U.S. alone through its in-store recycle program and other ink and toner recycled programs.

Figure 7: Staples U.S. Ink and Toner Cartridge Recycling



- **The Turbon Group** purchases a wide variety of empty toner cartridges in order to remanufacture them and they claim to create the highest quality aftermarket imaging supplies available. Even those cores which cannot be completely remanufactured may have reusable components or may be broken down and recycled in an environmentally friendly manner.

U.S.: OEM Summary of Activities

Accepted Products

For all OEM recycling programs, OEMs are usually only interested in receiving their own brands. For example, HP will always take back its own branded empty supplies, non-remanufactured, for recycling with a few exceptions. The combined HP and remanufacturer collection, along with HP's market share, result in HP branded cartridges typically being the most widely reused cartridges. Lexmark also takes back all of its empties (inkjet and toner) whether it is part of the discount return program or not. Lexmark also remanufactures four toner products for resale at a reduced cost. OEMs do not want remanufactured or refilled products, but they often accept them anyway. OEMs generally maintain policies stating that ineligible products can be returned at the sender's expense but usually will not send them back.

Most OEMs offer a worldwide program, but differ in scope with the stated intent of environmental stewardship. Some OEMs (including Canon, Epson Europe, and Xerox) have also had alliances with national environmental or charitable organizations in connection with their programs. HP has always demonstrated its interest in the environment as a corporate goal that goes beyond printer supplies to other products, and it publishes the most information about its recycling programs and the methods by which products are actually handled. In fact, HP announced in March 2008 it manufactures

new inkjet cartridges by using recycled ink cartridges along with other materials including water bottles. Canon, Lexmark and Xerox also provide a lot of detail about their programs for supplies and other products in its annual sustainability reports and on their websites.

In 2008, Epson started taking back their ink products in the United States. Users must send them directly back to Epson at their own expense. At this point, Canon does not collect ink tanks in the United States. In other countries, some programs are in place for Canon and Epson ink products. Canon and Epson have active programs to collect empty inkjet supplies in Japan.

Table 5: Supplies Empties Accepted by OEMs

OEM	USA	Europe
Brother	Ink and toner	Ink and toner
Canon	Copier All-in-One Cartridges, toner containers, large format ink cartridges, ink cartridges	Copier All-in-One cartridges; encourages users to use local recycling for toner bottles and ink cartridges.
Dell	Service available for every product	Service available for every product
Epson	In US, only take back cartridges for AcuLaser CX11N and ink cartridges	In Europe, Epson laser printer supplies (toners, fuser units, photoconductors, waste toner collectors, drum cartridges, imaging cartridges)
HP	Most ink and toner products, some exceptions including DesignJet CP, 791, 780 ink series supplies; Color LaserJet 5, LaserJet 9085 mfp, 9850 mfp laser supplies	Most ink and toner products, some exceptions including DesignJet CP, 791, 780 ink series supplies; Color LaserJet 5, LaserJet 9085 mfp, 9850 mfp laser supplies
IBM/InfoPrint	Most products accepted	Most products accepted
Konica Minolta	Toner cartridges, imaging units, waste toner bottles, developer/developer units and drum from every model	Toner cartridges, imaging units, waste toner bottles, developer/developer units and drum from every model
Lexmark	Service available for every Lexmark ink and toner product, return program or not	Service available for every Lexmark ink and toner product, return program or not
Samsung	All products including other OEMs	All products including other OEMs
Toshiba	All products including other OEMs and remanufactured	NA
Xerox	Pays for items on take back list. If not there, customer pays shipping to Close the Loop or can put in EcoBox also accepts Xerox branded HP and Brother replacement cartridges	Take back list similar to US. If not on list, can go in EcoBox or sent back at customers' expense also accepts Xerox branded HP and Brother replacement cartridges

Shipping of Cartridges to OEMs

It is generally acknowledged that the OEM incurs all costs for the return of empty cartridges as well as any processing of those cartridges. As a result, these programs require a significant investment; however, HP users can almost always depend on the aftermarket to pay for the empties because HP has the largest installed base of printers

(laser and inkjet). All of the OEMs that we investigated (including Canon, Epson, Dell, HP, IBM, Xerox, and Lexmark) clearly state that the collection of their empty supplies is always free to the customer. Remanufacturers cannot make the same claim, as they are selective in the products that they accept based on their value in the aftermarket.

Table 6: OEM Cartridge Return Programs

OEM	Toner	Ink	Recycling Processes Used
Brother	√	NA	Recycle it but majority goes to waste to energy which they buy back. Claim to remanufacture select SKUs.
Canon	√	NA	61% material recycling, 21% every recovery, 18% parts reuse (2008); Reuse parts that pass quality tests. Recycle the rest.
Dell	√	√	Claims all returned cartridges are recycled
Epson	√	√	All collections go to waste to energy.
HP	√	√	Claims 85% of HP LaserJet cartridges are recycled into new products; energy recovery for balance
InfoPrint	√	NA	Remanufacture or recycle all returned supplies
Konica Minolta	√	NA	Refurbish cartridges to new condition; recycle parts; rest of material disposed of through approved methods
Lexmark	√	√	About 70% recycled (toner); 26% reused, rest is waste to energy (2010). Inkjet cartridges remanufactured and broken down into component materials
Ricoh	√	NA	Majority of parts used again; rest recycled or waste to energy
Samsung	√	NA	Recycle into new materials through EPA partner facility; tiny amount to landfill
Toshiba	√	NA	Close the Loop which recovers 95% for reuse in new supplies, eLumber, or other products
Xerox	√	NA	Reuses majority; rest recycled, waste to energy or landfill

Lexmark offers a variant on the typical OEM approach to cartridge collection programs. Lexmark's program was formerly known as Prebate but is now simply called the Cartridge Collection Program. Customers essentially receive a discount (rebate) up front and promise to return the cartridge to Lexmark for recycling/remanufacturing after the cartridge is empty. Initially, the program was only available for toner cartridges, but a few inkjet SKUs are now included. Lexmark also added a Rewards Program for certain laser and inkjet printers. The program gives registered users the opportunity to get a free cartridge in exchange for returning cartridges back to Lexmark. For laser printers, the user must buy and return 10 Lexmark toner cartridges and they will receive a free cartridge. For inkjet printers, users that return five cartridges will get a free one and when users buy five cartridges they will also get a free one. Lexmark claims that this program can save customers up to 20% on their printing.



Incentives are rare, but companies like Lexmark, Dell, Toshiba, and Epson donate to non-profits. Xerox offered an incentive at one point, but this has since been eliminated. The company's research indicated that its customers were less motivated by incentives than they were by convenience.

InfoTrends Opinion

There is increased pressure on businesses that are running cartridge collection schemes to maintain environmentally responsible collection. No matter where a company sits in the industry, collections are expensive and difficult to run, and some players in the industry (particularly the smaller ones that might struggle to achieve the standard required) may decide not to commit their resources, rather they will seek more assistance from brokers for empties.

The environment was a hot topic in the hardware and supplies industry during the early and mid-1990s. Environmental awareness was primarily used as a marketing tool, and as such it complemented cartridge remanufacturing and refilling. In those days, there were fewer environmental laws. The environmental landscape has changed since that time, however, and today's laws govern the collection and recycling of used electronic equipment such as printers and copiers. While these regulations do not specifically cover supplies such as toner and inkjet cartridges, the industry is much more aware of the need to be environmentally conscious. In response, the supplies industry has shifted to participate in more plastics grinding/recycling and waste to energy activities instead of landfill. Furthermore, top remanufacturers are more willing to collect and reuse their own brand remanufactured laser cartridges; however this has had a minimal impact on the total.

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