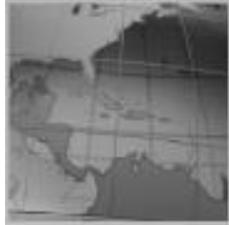


# Primary Research



January 2016

## U.S. Cartridge Collection and Recycling Report

## Executive Summary

This report presents the results of a research program by InfoTrends commissioned by HP to investigate cartridge collections, usage and disposal practices for remanufactured and newly built compatible ink and toner cartridges. InfoTrends interviewed 15 industry participants including remanufacturers, newly built compatible suppliers, cartridge empties collectors and channel members to understand the current situation. The following is a glossary of terms used in this report.

## Glossary

- **Bad Non-Virgin Empty:** A non-virgin empty that cannot be successfully remanufactured or one for which there is no market.
- **Bad Virgin Empty:** A virgin empty that cannot be remanufactured or one for which there is no market.
- **Bad Wrong Vender:** A cartridge originally produced by an OEM which is typically not remanufactured. Or a cartridge model that is not remanufactured
- **Clone:** NBC that violated patents
- **Empties collector:** A company that buys and sells empty cartridges.
  - A captive empties collector is owned by a remanufacturer. They are a profit center to the parent company and will supply primarily to the parent company as well as the aftermarket when excess empties are on hand.
  - Independent empties collectors are an independent business and serve the remanufacturing industry overall.
- **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, waste to energy (W2E))
- **Good non-Virgin Empty:** A non-virgin empty that can successfully be remanufactured.
- **Good Virgin Empty:** A virgin empty that can successfully be remanufactured.
- **Landfill:** Use of municipal waste. Municipal solid waste is commonly known as trash or garbage (US), refuse or rubbish (UK) is a type of waste consisting of everyday items that are discarded by the public. Depending on local laws, trash or

rubbish may be buried untreated or may first be incinerated before the ashes are disposed of based on local laws. Some municipal waste incineration may also be W2E. However measuring that mix is beyond the scope of this study.

- **New Build Compatible (NBC):** A 3<sup>rd</sup> party replacement cartridge that does not use an empty cartridge from an OEM, but rather uses a newly moulded cartridge shell and internal parts.
- **Non-Virgin Empty:** An OEM empty cartridge that has previously been remanufactured
- **OEM:** Original Equipment Manufacturer.
- **Recycling:** Crushing or melting components for use in other products or industries.
- **Remanufacturing:** The practice of cleaning, servicing, refilling, and re-using cartridges.
- **Remanufacturing Recycling Ratio:** Share of remanufactured cartridge waste that is recycled rather than sent to a landfill or incinerator.
- **Virgin Empty:** An OEM empty cartridge that has not been remanufactured.
- **W2E – Waste to Energy.** Burning of waste to produce electricity

### Key Findings

- Domestic remanufacturers shifting to remanufacturing their own cartridges has slowed (toner).
  - Difficulty getting virgin empties for certain models is constant
  - Some remanufacturers, particularly smaller ones, are increasingly remanufacturing Clover cartridges
- Dependence on own customers and own return programs dominates.
  - In the U.S., remanufacturers selectively approach their customers regarding collection of non-virgin empties.
- Chinese remanufacturers dominating the independent empty collectors.
  - First Sale Doctrine (U.S.) is driving Chinese demand for virgin empties. (see notes section of this slide for details on the First Sale Doctrine)
  - Domestic remanufacturers believe that the larger Chinese are mostly adhering to First Sale Doctrine but smaller Chinese likely not
  - Domestic remanufacturers site difficulty, due to mislabeling, knowing if a Chinese product is a remanufactured or an NBC
- OEMs have collection programs, but they are not affecting the availability of empties that much.
  - Demand from China a larger pressure on virgin empties availability.

- Inkjet transition from integrated cartridges to tanks increases availability of usable empties as shelf life of print head is not an issue on tanks.
  - Also makes remanufacturing of non-virgins more viable.
  - Remaining use of integrated cartridges moving toward lower end devices and remanufacturers view these cartridges as less robust than in the past

## Newly Built Compatible Findings

In speaking with the industry it is clear that almost all newly built compatible cartridges end up being thrown out by the users. With one small exception there is no effort by the manufacturers of NBCs to collect and recycle these cartridges at end of life. Other than the one exception, any collections of NBCs are unintended and accidental collections by the remanufacturing industry. Remanufacturers will not remanufacture an NBC due to concerns about patents as well as concerns about the quality and reliability of such a product.

Remanufacturers attempt to minimize this unintended collection but when it does happen the waste materials are recycled, sent to waste to energy or landfilled through the same process that the remanufacturer has for all of its waste and so the ratios for landfill, W2E and recycle below mirror what remanufacturers do with all of their waste materials.

## Remanufacturer findings

### What happens to cartridges that remanufacturers collect but can't use or sell?

Remanufacturers need to collect empty cartridges to remanufacture them and not all collected cartridges are suitable for use. The table above provides our estimates on what the remanufacturing industry does with cartridges and components that they cannot use or sell.

- Huge improvements have been built across the domestic remanufacturing industry to reduce the amount of product that is disposed in a landfill but the shift has slowed
  - Large domestic remanufacturers already largely avoid landfill
  - Chinese do not collect their own remanufactured cartridges at all
  - The market has consolidated with bigger players who are motivated to move to alternative disposal rather than landfill (ink & toner)
  - However, the overall proportion of remanufactured product that is recollected and disposed of is still a small minority of the overall number of remanufactured cartridges, most of which are never recollected and, therefore, end up in landfill.
- Sustainability is also a selling point in both regions, but more so in W.EU.

**Table 1: What happens to cartridges that remanufacturers collect but can't use or sell?**

	2016
<b>Laser</b>	
Landfill	49%
Waste-to-Energy/ Incineration	15%
Recycled	36%
<b>Total</b>	<b>100%</b>
<b>Inkjet</b>	
Landfill	29%
Waste-to-Energy/ Incineration	20%
Recycled	51%
<b>Total</b>	<b>100%</b>

### Unusable Remanufactured cartridge collections

Remanufacturers need to collect more cartridges than they can actually use because some collections are damaged or unusable because they are a remanufactured previously remanufactured by a different remanufacturer, an NBC that will not collect or of a type of cartridge that simply is not remanufactured.

Virgin empties have a lower defect rate than non-virgins but remanufacturers primarily remanufacture virgin cartridges as opposed to non-virgins so virgin represent a higher share of total bad collections than non-virgins.

Remanufacturers also accidentally collect cartridges that are simply not usable because they may be NBCs, simple toner cassettes and even toner bottles that they typically do not remanufacture.

On the inkjet side a significant volume of collections are bad-wrong vendor because many are ink tanks from vendors where the cartridges are not remanufactured. However those number had been higher as there is more remanufacturing on ink tanks now than in the past.

- Laser: Mix of bad Virgin vs Bad Non-Virgin driven by result of mix of overall use of virgin vs non-virgin + the success rate for each. Bad non-virgin has gone down largely because Clover and others are remanufacturing Clover cartridges

- Inkjet: Change driven by lower overall use of non-virgin due to shifting mix of OEM cartridges and integrated cartridges in lower end machines while higher end machines shifting to tanks

The table below shows the percentage of all collections that are bad /unusable for the three types described above.

**Table 2: Unusable remanufactured cartridge collections**

	2016
Laser	
Bad Virgins	8%
Bad Non-Virgins	5%
Subtotal	13%
Bad–Wrong Vendor	9%
Total	22%
Inkjet	
Bad Virgins	9%
Bad Non-Virgins	4%
Subtotal	12%
Bad–Wrong Vendor	20%
Total	32%

**Trend from 2007 through 2016**

The following table show the values for both Toner and Ink for the years the report has been commissioned by HP for the US.

**Table 3: Toner Reman Trend Summary from past studies**

Toner					
2007	2009	2011	2014	2016	
99%	95%	94%	89%	88%	% of remanufactured cartridges sold which will ultimately be thrown away due to remanufacturer preference to work with cartridges that have never been remanufactured and lack of recycling for unusable cartridges and replaced parts

85%	83%	81%	78%	<b>78%</b>	% of toner cartridges that are remanufactured only one time
15%	17%	19%	22%	<b>22%</b>	% of toner cartridges that are remanufactured from non-virgin cores
16%	20%	20%	23%	<b>22%</b>	% of toner cartridges that remanufacturers collect (are not suitable for remanufacturing) that cannot be profitably remanufactured.
90%	71%	65%	50%	49%	% of unusable cartridges and components that go to the landfill

**Table 4: Ink Reman Trend Summary from past studies**

Ink					
2007	2009	2011	2014	2016	
99.8%	95%	92%	90%	<b>90%</b>	% of remanufactured cartridges sold which will ultimately be thrown away due to remanufacturer preference to work with cartridges that have never been remanufactured and lack of recycling for unusable cartridges and replaced parts
90%	90%	90%	85%	<b>88%</b>	% of ink cartridges that are remanufactured only one time
10%	10%	10%	15%	<b>12%</b>	% of ink cartridges that are remanufactured from non-virgin cores
35%	41%	40%	35%	<b>33%</b>	% of ink cartridges that remanufacturers collect (are not suitable for remanufacturing) that cannot be profitably remanufactured.
99%	60%	40%	30%	29%	% of unusable cartridges and components that go to the landfill

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