KEYPOINT INTELLIGENCE | *InfoTrends*

SERVICE AREAS:

PRIMARY RESEARCH

AP CARTRIDGE COLLECTION AND RECYCLING REPORT 2018

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Executive Summary

This report presents the results of a research program by InfoTrends to investigate cartridge collections, usage and disposal practices for remanufactured, refilled and newly built compatible ink and toner cartridges. InfoTrends interviewed 51 industry participants including remanufacturers, refillers, newly built compatible suppliers, and resellers in China, India, Australia, S. Korea, Indonesia and Thailand to understand the current situation. The following is a glossary of terms used in this report.

Glossary

- 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.
- New Build Compatible (NBC): A 3rd party replacement cartridge that does not use an empty cartridge from an OEM, but rather uses a newly molded cartridge shell and internal parts.
- Clone: NBC that violated patents
- Empty/core: 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))
- 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.
- 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.

- Remanufacturing Recycling Ratio: Share of remanufactured cartridge waste that is recycled rather than sent to a landfill or incinerator.
- Remanufacturing: The practice of cleaning, servicing, refilling, and re-using cartridges.
- Refilling: the cartridge is typically not opened or cleaned inside, and components are not typically replaced. The cartridge is simply refilled with toner or ink.
- 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.

Key Findings

- Very significant change among remans and refillers now using empty NBC for their product
- NBC suppliers collect some empties to remanufacture and refill
- Refilling is no longer just a walk-in business. Refillers depend on collections for their empties supplies
- Refill cartridges are sold across countries suggesting a strong graying of the distinction between reman and refill
- Remans ending up in landfill actually went up slightly due to reported lower use of recycling among remans to dispose of collected waste
- Refills ending up in landfill went down slightly due to their recycling ratio moving upward as it appears that remans and refillers are becoming less distinct
- Despite remans and refillers as well as NBCs using NBC empties to reman or refill, the very large majority of NBCs still ultimately are thrown in the trash

Remanufacturer findings

Below are a series of findings regarding remanufacturer collections and processes.

Remanufactured cartridges that will ultimately go to landfill

The volume of cartridges that ultimately end up in landfill is a combination of those cartridges that users throw away because they are not collected again by the

remanufacturing industry and the much smaller volume of unusable cartridges and cartridge components that the remanufacturing industry collects but do not recycle or sent do water to energy. There is also a small volume of cartridges that users are able to send directly to recycling, mainly in China.

The volume of remanufactured cartridges that ultimately end up being thrown out is quite high though the percentage has been slowly going down.

- Landfill rates have gone up slightly
- The estimate has increased mainly because of an increase in reported landfilling for collected reman waste
- Remans in ROA report that they are struggling badly against NBCs and refill and may not have the capability to recycle as they may previously have had
- We no longer try to estimate the share of user waste that is scavenged out of landfill so in part 2018 is not exactly comparable to 2014 and 2012
- We do still account for estimated user recycling (recyclers picking up user waste)

Table 1: Remanufactured cartridges that will ultimately go to the landfill

	2018
Laser	72%
Inkjet	81%

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 below provides our estimates on what the remanufacturing industry does with cartridges and components that they cannot use or sell.

- Respondents report significant changes in four years.
- Waste-to Energy has more than doubled while recycling has declined, and Landfill has increased
- These changes may be the result of ongoing pressure from NBC and refill on remans and likely a decline in scale of remans outside of China
- As will also be noted multiple times, it appears that the line between reman and refill is graying, many remans or refillers do both and that while these landfill rates have gone up, refillers landfill rates have gone down

Table 2: What happens to cartridges that remanufacturers collect but can't use or sell?

	2018
Laser	
Landfill	44%
Waste-to-Energy/ Incineration	25%
Recycled	31%
Total	**100%**
Inkjet	
Landfill	52%
Waste-to-Energy/ Incineration	31%
Recycled	17%
Total	**100%**

Cartridges remanufactured from non-virgin cores

Below are the estimates shared of remanufactured toner and inkjet cartridges that are remanufactured using a previously remanufactured cartridge. As part of a product that relies in part on the environmental benefits of using a remanufactured cartridge, one aspect of that message could be the extent that a remanufactured cartridge that originally reuses an empty OEM cartridge is actually remanufactured a second time. In this case the share that are remanufactured a second time is relatively low. Most remanufactured cartridges are only remanufactured once. The following are key points on this particular metric.

Toner

- Toner use of von-Virgins has fluctuated over the three years and may not be indicative of a long-term trend
- The significant increase in the use of NBCs has also likely confused the respondents' ability to make this distinction

Ink

- Questions were worded to ask respondents to only consider integrated ink cartridges and if they were able to make that distinction then it make sense for non-virgin use of ink cartridges to decline as integrated ink cartridges tend to be used in low price products and are not intended to have the life that they once had

Table 3: Cartridges Remanufactured from non-virgin cores

	2018
Laser	35%
Inkjet	32%

Reman unusable cartridge collections

Remanufacturers need to collect more cartridges than they can actually use because some collections are damaged or otherwise unusable.

Virgin empties have a lower defect rate than non-virgins, but remanufacturers primarily remanufacture virgin cartridges as opposed to non-virgins. As such among total collections the ratio of bad virgins to bad non-virgins are closer together than the ratio of their respective usage. 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.

Bad-Wrong vendor primarily relates to cartridge models that are so simple that it's impossible for remans to make a profit on based on competition between NBCs and refill. Inkjet Bad-Wrong vendor is actually the largest part of the remanufactures ink waste collections. We expect that this is very much related to the many simple ink tanks in the market.

Table 4: Unusable remanufactured cartridge collections

	2018
Laser	
Bad Virgins	9%
Bad Non-Virgins	8%
Subtotal	17%
Bad–Wrong	9%

Vendor	
Total	**21%**
Inkjet	
Bad Virgins	9%
Bad Non-Virgins	11%
Subtotal	20%
Bad–Wrong Vendor	17%
Total	**37%**

Refilled Cartridge Findings

Following are a series of metrics on refilled cartridge activities.

Refilled cartridges that will ultimately go to landfill

- Refillers report that the rate at which their cartridges ultimately end up being throw (Landfilled) out has decreased slightly.
- Changes causing this likely stem from the graying of the line between reman and refill and that many refillers are also remanufacturers such that they would operate on a larger scale and have access to recycling facilities
- This graying could also account for the increase in which refillers are taking back their empties

Table 5: Refilled cartridges that ultimately end up in landfill

	2018
Toner	89%
Ink	90%

Refiller disposal of unusable cartridges

- Refillers report changes in waste disposal trends which bring their ratios closer to the ratios reported by remanufacturers. While reman recycling rates went down, refillers recycling rates have gone up

- Causes could be the continued graying of the line between refill and reman as well as that many remanufacturers were also refillers and vice versa so their disposal ratios may be converging

- Refillers like remans report a significant increase in W2E

Table 6: Refiller disposal of unusable cartridge waste

	2018
LASER	
Landfill	58%
Waste-to-energy	18%
Recycled	23%
Total	100%
INK	
Landfill	64%
Waste-to-energy	19%
Recycled	18%
Total	100%

Virgin vs. non-Virgin cartridges and failure rates

- Refiller respondents did not indicate changes when it comes to failure rates related to refilling virgin or no virgin cores

- This is a bit surprising given that refillers are using NBC but it's also possible that while asked to only consider integrated ink cartridges they may be including all ink cartridges

Table 7: Refill Virgin and non-virgin usage and failure rates

		Virgin vs Non-Virgin	Failure rates	Percent of Cartridges that

		Share		Fail
Toner	Virgin Core	25%	10%	2.5% (25%x10%)
	Non-Virgin Cores	75%	25%	19% (75%x25%)
	X times refilled	5-9		
	X Times refilled before the drum is replaced	3-4		
Ink	Virgin Core	30%	10%	3% (30%x10%)
	Non-Virgin Core	70%	30%	21.5% (70%x30%)
	X Times refilled	5-8		

Newly Built Compatible Findings

NBCs that end up in landfill

As can be assumed from the analysis above, changes are happening in terms of what happens to NBCs at end of life. About 10% of toner and ink NBCs become remans or refills. However, that doesn't mean that a great deal more NBC avoid being landfilled at end of life. Still NBC manufacturers are not collecting NBCs for the purpose of recycling them. They are collected to be turned into reman and refill.

- Still the huge majority of NBC ultimately and up being thrown in the trash.
- Despite remans and refillers now using NBCs in their operations, the percentage of NBCs that end up being remanufactured or refilled and then recollected to recycled remains very small
- There is no indication that NBCs are collecting to recycle but only collecting to reman or refill

Final Disposition of NCSs at end of life

The figures below describe the estimates used to calculate the shar of NCs that end up in landfill.

The process is different from what was used to estimate final disposition of remans and refill because the dynamics are different.

The fist step, as illustrated on the bar charts on the left below for toner and ink, is to estimate the required number of NBCs to meet the reported use of NBCs that remans and refillers use. For that the overall market shares provided at the beginning of this report were used.

Using the toner graphic below to describe the estimates, remans and refillers report that 16% and 14% of Reman and refill toner cartridges are made from NBCs. Based on those figures we estimated the share of all NBCs that are collected or that purpose. Added into the calculation is an inflation factor for extra cartridges needed due to damage or wrong product. The result is that for toner, 5.8% of NBCs are collected and made into refills. Similarly, 4.3% of NBCs are made into refills.

There are no purposeful collections of NBCs for the purpose of recycling so the estimates above are subtracted from the middle bar which shows what happens to NBCs when they are first empty. 10% are recollected while 90% are thrown out by the customer.

For the 10% of NBCs that are collected, they are split between NBC collections and reman and refill collections. Finally, using the overall landfill metrics for reman and refill cartridges that end up in landfill from the reman and refill discussions above, we estimate the share of reman and refills from NBCs that are ultimately landfilled.

The totals at the right provide the final estimates for cartridges that end up in landfill based on those that are remanufactured, refilled or simply thrown out by the end user then the cartridge is empty. Those estimates are 97.8% for toner NBCs and 99.3% for ink NBCs. So, while remans and refillers are now using NBCs in their processes, that activity has little impact on the bottom line.

Table 8: Newly built cartridges that will ultimately go to landfill

	2018
Toner	97.8%
Ink	99.3%

opinion

InfoTrends' Opinion

OEM cartridges remain the largest choice that users are making when they need cartridges for their inkjet or laser device but 3rd party products are also very popular in the Asia Pacific region. Remanufactured cartridges are seen as losing market share to NBCs and refills as they are not necessarily seen as better then the other two in terms of quality and reliability, but they are more expensive. In several countries it appears that the reman industry may be in great peril.

OEMs are seen as maintaining their market share while NBC and refill are taking share from reman.

The reman and refill industries are seen as changing with refill in particular filling the role of reman as an environmental alternative to NBCs as refill, (and reman) reused in existing product. Refill is becoming for packaged product focused and less as a micro business industry as it was in the past.

While reman and refill use existing cartridges as their claim to being environmentally friendly, the results of this study conclude that very large majorities of those products are still thrown in the trash at end of live and only a small percentage as a whole are recycled.

NBC producers are now collecting back their own empties but that appears only to use those empties as reman or refill. There does not appear to be a strong collections effort with the coal of keeping the product out of landfill at end of line.

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John Shane is a leading industry expert on marking materials such as toner, OPC, inkjet ink, and cartridges. As a Director for the Communication Supplies Consulting Service, Mr. Shane is responsible for all forecasts, research reports, consulting, and client care concerning those topics. He is a well-known authority on all-in-one toner cartridges, the cartridge recycling industry, and the world toner industry. In addition, he has conducted extensive research following similar trends related to inkjet cartridges, refills, and compatibles. Having consulted on these markets since 1988, Mr. Shane is a frequent expert presenter at industry conferences and trade events.

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