

Forces Shaping Today's Cartridge Remanufacturing Industry



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Executive Summary

- Established in the United States in the 1980s, the cartridge remanufacturing industry rapidly spread to Europe and China and was doing billions of dollars worth of business worldwide by the early twenty-first century.
- As end users searched for low-cost alternatives to higher-priced cartridges from printer and copier manufacturers, demand for third-party ink and toner supplies skyrocketed during the 1990s and the global industry expanded.
- Remanufactured cartridges became consumer packaged goods and quickly penetrated various retail channels including mass merchants, office super-stores, consumer electronics retailers, and eventually even pharmacies and grocery stores.
- To better meet growing demand, Western remanufacturers sourced additional products from Chinese third-party supplies manufacturers.
- Some companies changed their business models from remanufacturing to distribution because it was more cost effective to import cartridges from China than to produce them internally.
- As the industry matured and consolidated, large companies with hundreds of millions of dollars in annual revenue emerged to dominate the industry in the West.
- Prices of remanufactured cartridges dropped as more products were imported from China, and large Western remanufacturers achieved economies of scale that allowed them to lower fixed costs.
- To avoid the fixed costs associated with remanufacturing, such as the purchase and reverse-logistics expenses of gathering empties, Chinese companies manufactured cartridges made from new parts.
- While some of the new cartridges from China were reverse-engineered to avoid patent violations, others were copied—or “cloned”—without regard for OEM intellectual property.
- Cloned cartridges typically are not collected and reprocessed by remanufacturers because clones are made from low-quality components that violate OEM intellectual property and put remanufacturers at risk of infringement lawsuits.

- In addition to being undesirable for remanufacturing, clones have poor “green” credentials because they may not conform to the same environmental regulations as newly built OEM cartridges.
- Despite the legal risks and poor environmental record of clones, the worldwide availability of ink and toner clones exploded along with the number of OEM lawsuits associated with clones.
- Faced with relentless pricing pressures, the increased risk of lawsuits, and shrinking domestic markets, many Western remanufacturers exited the space, which has forced many of their suppliers to do the same.
- Going forward, the ranks of the remanufacturing industry worldwide will continue to thin as consolidation accelerates in China and the attrition rate of the industry in the West continues.

Introduction

Although they retain the capacity to refurbish millions of ink and toner cartridges each month, the once-booming remanufacturing industries in North America and Europe have declined significantly. Meanwhile, the third-party supplies industry in China remains enormous but is beginning to consolidate. Western remanufacturers have had to endure a shrinking market while coping with an influx of new cartridges produced overseas and sold at artificially low prices. While once there were more than 10,000 remanufacturers in the United States and Europe, today there are fewer than 1,000 in the United States, and a couple of thousand companies continue to remanufacture throughout Europe. Thousands of factories continue to produce ink and toner cartridges in China, but the number will drop as the urge to merge becomes just as irresistible in China as it did in the West.

The Western industry's decline has been bad news for the regions in which it operates. Remanufacturers provided important light manufacturing jobs to workers throughout the United States and Europe. Just over a decade ago, production lines at thousands of remanufacturing factories in the West were staffed by tens of thousands of employees while scientists and engineers worked at a myriad of high-tech firms to produce the raw materials such as inks, toners, and other components needed to produce remanufactured cartridges. In addition to creating a range of jobs for a diverse workforce, remanufacturing ink and toner cartridges prevented tons of solid waste from entering landfills in Europe and North America Western annually.

This report will examine why the remanufacturing industry in the West has contracted so dramatically while the number of third-party supplies manufacturers in China has grown and how that has impacted the markets these industries support.

TRENDLINE**1980s**

Remanufacturing Trends Foreshadowed

Companies marketing third-party consumables for light-lens copiers, typewriters, and impact printers begin refilling toner and ink cartridges in the United States and are quickly followed by firms in other regions, including China and Europe.



OEMs offer a limited number of machines based on only a few imaging engines,

resulting in a homogenous installed machine population that remanufacturers can penetrate with a select few cartridges remanufactured in-house.

Companies invest to become vertically integrated, as China's third-party supplies industry emerges from a handful of impact-ribbon manufacturers based largely in Hong Kong and along the southern coast of mainland China.



With a small domestic market, Chinese third-party firms look to supply Western

channel partners and remanufacturers with cartridges, linking the Western remanufacturing industry with China.

A Quick Look Back

Growing out of the industries that supported analog hardcopy devices such as typewriters and light-lens copiers, the remanufacturing industry got its start in the United States in the 1980s and quickly spread to other regions. During the 1990s, the growing ubiquity of desktop computers with attached printers in Europe and North America fueled cartridge demand. In response to surging demand, ink and toner cartridges became a fixture at many Western retail outlets, and consumables from hardware manufacturers such as Canon, Epson, HP, and others grabbed shelf space. It was not long, however, before retailers also began devoting some of their prime real estate to remanufactured cartridges as a growing number of consumers looked for less-costly alternatives to new cartridges from original equipment manufacturers (OEMs).

By offering retailers big margins, remanufacturers in the early 2000s effectively countered the marketing dollars OEMs provided. Remanufactured cartridges quickly became the darlings of category managers at a variety of retailers, including computer and office superstores, mass merchants, consumer electronic stores, supermarkets, and pharmacies. Some retailers even began refilling cartridges in their stores. By 2003, a number of small shops dedicated to remanufacturing cartridges or selling finished cartridges—or both—had opened in Europe, the United States, and other regions. In addition to all the brick-and-mortar retailers offering remanufactured cartridges, the Internet emerged as an important channel for consumables during the first couple of years of the new century.

A virtuous circle was established as the remanufacturing industry in the West successfully established itself with various channel partners. Often, consumers would first encounter remanufactured cartridges in the office and then see similar products online, in office-supplies catalogs, and at the retail stores they frequented. As awareness grew, so did remanufactured cartridge sales, which encouraged the channels to further promote remanufactured cartridges. By 2003, non-OEM cartridges were promoted heavily with in-store retail signage as well as in weekly store circulars and pop-up web ads. Some retailers even invested in television spots. All the advertising helped to grow consumer awareness and further validate the category, which led more retailers to offer remanufactured cartridges.

Between the year 2000 and 2005, the remanufacturing industry enjoyed uninterrupted revenue growth. Many remanufacturing companies in Europe and the United States grew as the channels looked to expand their selection of non-OEM supplies. The value of the worldwide market

Having grown quickly for nearly two decades, by 2005 the industry was maturing and becoming increasingly stratified

for third-party cartridges used in homes and offices soared to over \$10 billion and about two-thirds of that market was in Europe and the United States. Market share in the West for remanufactured toner cartridges used in office monochrome printers grew to between 30 and 35 percent, and third-party ink cartridges held between 20 and 30 percent of the market.

Consolidation Cometh

Even as the industry was experiencing its early-twenty-first-century growth spurt, it also began to consolidate. The consolidation has continued to the present day. As a result, a few enormous companies have emerged to dominate the Western industry along with many much smaller competitors.

Having grown quickly for nearly two decades, by 2005 the industry was maturing and becoming increasingly stratified. Through key acquisitions, certain big companies became bigger and expanded their market reach and production capacity while gaining the economies of scales that larger players accrue. These firms began to purchase raw materials directly from suppliers, which put pressure on certain distributors that were being cut out of the market. By lowering their production costs, larger firms became increasingly well positioned to take share from smaller players because they could lower prices while maintaining margins.

The largest remanufacturer in North America, Clover Imaging Group (CIG), got where it is today in part through successful acquisitions that began in the middle of the past decade. Established in 1997, the company, which was then known as Clover Technologies Group, grew rapidly. In 2004, it was ranked number 36 on *Inc.* magazine's list of the 500 fastest-growing privately held companies. Clover made the list after achieving 642 percent revenue growth in the four-year period ending in 2003, when the firm's sales totaled \$68 million. In 2005, Clover purchased Dataproducts and several other compatible printer supplies brands from Ricoh Printing Systems America. The acquisition gave Clover shelf space at various retailers, manufacturing plants in Mexico and Portugal, and distribution facilities on the U.S. West Coast and in Europe. Clover's merger and acquisition (M&A) activity ramped up after the Dataproducts purchase, and the company gobbled up various remanufacturers both inside and outside the United States. In 2010, Golden Gate Capital took a position in the company, and since then Clover's M&A streak has continued and the company has grown its annual revenue to over \$1 billion.

Just as Clover snapped up assets to compete in Europe and other regions, Germany's Turbon Group made acquisitions of its own to strengthen its business in North America and Europe. Growing through acquisition does not guarantee success, however, and Turbon has struggled in the past couple of years.

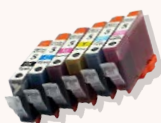
During the second half of 2013, Turbon America, the firm's U.S. subsidiary, announced it would purchase Saddle Brook, NJ-based Clarity Imaging Technologies. Shortly thereafter, Turbon revealed plans to acquire International Laser Group (ILG), based in Woodland Hills, CA.

TRENDLINE**1990s****Market Trends Become Clearer**

Digital printer and copier shipments explode and by the end of the decade roughly 100 million new machines ship annually to markets around the world.



Western retailers devote shelf space to remanufactured cartridges as a growing number of consumers in Europe and the U.S. search for alternatives to more expensive OEM cartridges.



Ranging from small “mom-and-pop” shops to companies with hundreds of millions of dollars in annual sales and employing thousands, by 2000 the number of remanufacturers swells to 4,500 in the United States and even more in Europe. Even OEMs including HP, Lexmark, and Xerox launch remanufactured cartridge lines.



Remanufacturing processes improve and higher-quality inks, toners, and other raw materials become available from firms in



Europe, Japan, and the United States. Empty brokers support the growing remanufacturing industry in Europe

and the United States and a network of supplies distributors emerges to support remanufacturers with raw materials as well as technical expertise.



Lacking the production capacity to produce the broad assortment of SKUs needed for the increasingly diverse and expanding machine installed base, Western remanufacturers increasingly source products from China, and the People's Republic emerges as a major exporter of non-impact digital consumables.

Turbon also acquired the Austrian ink and toner cartridge remanufacturer Embatex in 2015. Turbon's goal was to grow its total revenue to €110.0 million in 2015, but it fell short by a few million euros. Revenue declined in 2016 and is expected to total between €95 million and €100 million in fiscal 2017. The firm predicts that its cartridge remanufacturing business will continue to decline in 2018 due in part to the loss of a large European customer. Turbon is currently making acquisitions outside of the imaging industry to grow.

Turbon is not the only Western remanufacturer struggling to turn a profit following an acquisition. Actionable Intelligence ranks Phoenix, AZ-based LMI Solutions as North America's second-largest remanufacturer after Clover. The privately held company does not disclose financial information, but we estimate its annual revenue at \$100 million to \$125 million. Like Turbon, LMI has made several acquisitions over the past few years and the results have been lackluster.

In 2014, LMI acquired Global Printer Services (GPS) and Printersdirect, two of the largest printer remanufacturers in North America. The company also acquired the printer parts distributor Parts Now in 2015. These strategic acquisitions should have strengthened LMI's position with office-equipment dealers and IT value-added resellers (VARs), especially those offering managed print services (MPS) contracts. LMI looked to offer MPS providers low-cost hardware and access to a comprehensive range of break/fix parts. Since the acquisitions, however, persistent rumors have circulated that the company has had cash-flow problems. The firm has also lost several large clients to rival cartridge and printer remanufacturers.

While many Western remanufacturers have struggled to make their acquisitions successful, Chinese companies have demonstrated a willingness to invest in the non-OEM supplies industry both inside China and in foreign markets. While it is a bit early to say how successful this strategy will be, we do see a trend emerging, which we will discuss in more detail later.

Connecting with China

In addition to Golden Gate, a number of other investors have poured money into the non-OEM supplies industry. Not all, however, found remanufacturing to offer the best return on investment. Such was the case with Chicago-based private-equity investment firm Reliant Equity Investors (REI) when it purchased Rhinotek, a remanufacturer based in Carson, CA, that sold a well-known national product line of consumables. REI was said to have been attracted to Rhinotek because of the remanufacturer's

Changes in the equipment population in Europe and North America helped forge the bond between China and the West

strategy for importing Chinese products. The investment firm wanted to expand on that strategy and rely exclusively on importing rather than producing products in-house. Following a prevailing trend that many companies followed as the industry matured, REI fundamentally changed Rhinotek's business model such that the company became a distributor of products made in China rather than a remanufacturer.

China had an established track record as a reliable source of low-cost, non-OEM printer supplies by the time REI purchased Rhinotek during the summer of 2006. In the 1980s, the Chinese third-party supplies industry was formed around a handful of firms based largely in Hong Kong and along the southern coast of mainland China that manufactured impact ribbons. Unlike the industries in the United States and Europe, China's third-party supplies industry did not target local markets because these markets were too small to offer much of an opportunity. Instead, the Chinese industry set out to be a supplier to Western channel partners and remanufacturers. The growth of the Western and Chinese remanufacturing industries were thus inextricably linked.

Changes in the equipment population in Europe and North America helped forge the bond between China and the West. During the 1980s and in the early 1990s, OEMs released a limited number of machines that were based on a handful of imaging engines. This allowed remanufacturers to address most of the machines in the installed base with a select few cartridges that they could remanufacture in-house. As digital printing became more popular, however, the printer population grew more diverse. By the late 1990s, Western remanufacturers were hard-pressed to cover the expanding installed base with just the cartridges they were producing. The Western industry lacked the capacity to produce the broad assortment of SKUs needed for all the different machines in the field. To augment their production capacity, Western remanufacturers like Rhinotek began sourcing products from China.

Initially, Western remanufacturers turned to the Chinese industry because it had the capacity that the Western industry lacked. As they became familiar with the Chinese cartridge industry, however, Western companies realized it could be more economical to import ink and toner cartridges than to remanufacture the cartridges themselves. By the time REI acquired Rhinotek in 2006, many Western remanufacturers were sourcing some or all of their ink and toner cartridges from China. Over time, China's grip on Western markets intensified as more remanufacturers in Europe and the United States flipped from being remanufacturers to becoming distributors. While some Western remanufacturers did keep certain production lines open, by 2005 more than half of the third-party supplies sold in the West originated in China.

Chinese third-party supplies vendors have maintained a major presence in Europe, the United States, and most consumables markets worldwide. Even so, relationships between many Chinese suppliers and their Western customers have become strained over the years as an increasing number of Chinese firms opened distribution subsidiaries in the West. Today, many Western remanufacturers that long ago switched their businesses to become distributors find themselves competing with their suppliers as Chinese subsidiaries pursue the same customers as the Western firms.

TRENDLINE 2000-05

Growth & Competition in the Industry

The global remanufacturing industry enjoys uninterrupted revenue growth and by 2005 the worldwide market for third-party cartridges soars to over \$10 billion with about two-thirds of that market located in Europe and the United States.



Market share in the West for remanufactured toner cartridges used in office monochrome printers grows to between 30% and 35% and third-party ink cartridges hold between 20% and 30% of the market.

Offering big margins, a range of retail channels—including computer and office superstores, mass merchants, consumer electronic stores, supermarkets, and pharmacies—offer remanufactured ink and toner cartridges, which become consumer packaged goods along with OEM products. The Internet also grows as an important consumables channel.



A number of small shops dedicated to remanufacturing cartridges or selling finished cartridges—or both—open in Europe and the United States as well as in other regions.

Working with the Chinese cartridge industry, certain Western companies find it more economical to import finished products rather than remanufacture cartridges themselves. Many switch their business models from remanufacturing to distribution.



Price Wars!

As noted earlier, the remanufacturing industry experienced strong growth during the first five years of the twenty-first century. Although the industry continued to see some incremental growth, business at many remanufacturers began to cool after 2005. Winning new customers was challenging because most retailers and other potential channel partners had established relationships with one or more remanufacturers, and it was difficult to swoop in and grab that business. To sustain growth, many Western remanufacturers found they needed to slash prices, which led to rampant margin erosion.

Companies that market non-OEM consumables have a long history of competing on price. While the remanufacturing industry does have an environmental angle to promote, the cornerstone of the industry's value proposition always has been that it offers products priced lower than OEM products. As the industry matured, remanufacturers largely moved away from their environmental marketing message and started competing with each other solely based on price, the same way they had with OEMs. This resulted in an industry-wide price war that forced many remanufacturers to abandon their pricing discipline. In no time, margins were squeezed so much that remanufacturers began frantically searching for ways to lower the costs of the products they brought to market.

Competition based on price further accelerated the ongoing consolidation of the remaining remanufacturers in Europe and the United States. Merged companies found ways to lower production costs by doing more with less. Over the past ten years or so, layoffs have been common, as merged companies lowered staffing levels and trimmed payrolls. As discussed above, larger firms also achieved new economies of scale that allowed them to work directly with their suppliers, thereby negotiating more favorable terms and eliminating costs associated with distributors. While larger firms did manage to improve margins, most of their cost cutting was passed along to customers in hopes of lowering the risk of losing the customer to a competitor.

From 2005 onward, large remanufacturers grew to dominate the market. These companies had the capacity to supply large retailers as well as many second-tier distributors. Smaller remanufacturers found it increasingly difficult to beat the lower prices offered by larger competitors. As a result, more small companies shut down their production lines and imported additional products from China, while a growing number were forced to exit the industry altogether.

Despite the negative environmental and legal issues surrounding ink and toner cartridges made from newly built cores, these products offered a cost advantage that many Western companies found irresistible

Like their competitors in the West, Chinese remanufacturers were well versed in competing on price. Chinese companies could draw from a seemingly endless pool of cheap labor, so they always had an advantage in terms of production costs. Entrepreneurs in China also invested to keep their manufacturing costs as low as possible. Today, most large Chinese companies are vertically integrated and have the manufacturing assets to produce their own raw materials internally. Being vertically integrated has allowed Chinese third-party cartridge companies to replace expensive Western raw materials with those produced domestically at much lower costs. At one time, almost all of the raw materials used by Chinese third-party supplies vendors came from foreign sources. Today, that is no longer the case.

For more than a decade, most of the leading third-party supplies firms in China have been producing their own inks, and some manufacture toners and drums in-house. From the earliest days, Chinese firms invested in acquiring the equipment to produce their own cartridge components. To do so, these companies purchased injection-molding equipment and high-tech mold-making machines, including so-called CNC (computer numerical cutting) units. All this equipment was expensive, but companies found they could quickly recoup their investments by making their own tools and molds and producing all their own cartridge parts.

Among the most important—and expensive—raw materials that remanufacturers must purchase are empty cartridges, which are also known as cartridge “cores” or simply as “empties.” Depending on the SKU, cores represent between 50 and 70 percent of the total raw materials cost of a cartridge remanufactured in the West. Cores are either collected by a remanufacturer or purchased from an outside source. The price of empties fluctuates along with core availability and they can become very pricey. To avoid the costs of empties, some companies in China began using their injection-molding equipment to make their own cores instead of importing them.

Because they are not remanufactured from an empty that may otherwise end up in a landfill, cartridges made from newly manufactured cores lack the positive environmental benefits remanufactured cartridges provide and may not conform to the same environmental regulations as newly built OEM cartridges. In fact, there is a distinct environmental downside to third-party cartridges made from new cores. Remanufacturers avoid refurbishing these empties because they often contain low-quality components that may violate OEM patents and put remanufacturers at risk of infringement lawsuits. Despite the negative environmental and legal issues surrounding ink and toner cartridges made from newly built cores, these products offered a cost advantage that many Western companies found irresistible.

Clone Troubles

Chinese firms have been marketing cartridges made from new cores since the earliest days of the industry. Although some companies work hard to design new cores that do not infringe any OEM intellectual property (IP), a number of Chinese companies market new-build compatibles that have been reverse-engineered with little or no regard for IP. Often referred to as

TRENDLINE 2005-08

Winds of Change

Winning new customers gets challenging for remanufacturers by 2005 because most potential channel partners have established relationships with one or more remanufacturers. Outsiders can no longer just swoop in and grab business.



Remanufacturers slash prices to sustain growth, resulting in margin compression that forces remanufacturers to frantically search for ways to lower production costs.

The maturing Western remanufacturing industry is increasingly stratified as big companies become bigger and expand their market reach and production capacity while gaining economies of scale.



As large remanufacturers grow and dominate the market, more small

companies shut down production lines and rely exclusively on products from China or exit the industry altogether.



By 2005, more than half of the third-party supplies sold in the West originate in China. Some companies in China begin making their own cores (a.k.a., clones) instead of importing empties.



"clones" for obvious reasons, these newly built compatibles infringe OEMs' patented cartridge inventions. Worse still, because clones are sometimes marketed as remanufactured cartridges, they are also sold using false or misleading marketing claims.

Regulations imposed by the Chinese authorities on the industry's importation of empties into China contributed to the development and proliferation of clones. In China, companies must have a license to import cores because the Chinese government is wary of allowing firms to import what is essentially e-waste. Licenses always have been difficult to obtain and they are limited to a select few companies. Unlicensed companies are at a disadvantage because they must purchase empties on the open market, often from a competitor that charges a substantial markup. Having a ready source of cheap new-built cores was a great solution for unlicensed companies' core problems despite the fact that these cores often infringed OEM patents.

Simple cloned ink tanks began penetrating markets in Europe and the United States in the 1990s. By the turn of the century, various OEMs, including Canon, Epson, and HP, had won legal battles to protect Western markets. But the tsunami of cloned ink tanks was hard to reverse and, by the early twenty-first century, millions of infringing ink tanks had been sold and more were shipping every year, often at price points well under \$1 per cartridge.

Clones for electrophotographic devices also have been available for decades. Like the toner bottles used in older analog copiers, toner bottles for newer digital copiers are relatively easy to clone. The technologies in many of these toner containers are few and focused mainly on how the container sits inside a device and supplies it with toner. Thus, for many years, infringing consumables have been available for copiers and MFPs from vendors such as Canon, Ricoh, and others. Likewise, clone makers also developed cloned toner containers for laser/LED printers from Brother, OKI, Samsung, and other firms that employed a separate toner container and imaging drum. With relatively little technology found in the toner container, these designs were easy to knock off.

While toner bottles and ink tanks were easy targets, many in the industry felt it would be nearly impossible for third-party supplies vendors to produce a new-built toner cartridge with the toner and drum integrated in a single unit. These types of toner cartridges are used in some of the world's most popular laser printers, including HP's LaserJet units as well as machines from Canon, Lexmark, and others. The tolerances in integrated toner cartridges,

The 2008 contraction in the global economy would forever change the Western cartridge remanufacturing industry

also known as “all-in-ones,” are exacting, and it was widely believed the technology was beyond the capabilities of any non-OEM vendor. The performance of the first all-in-one toner cartridge clones that hit the market approximately 15 years ago was poor. Over the past decade and a half, however, clone makers have invested billions of dollars to precisely duplicate OEM cartridges’ external shells along with the toners and components inside them. While the performance of many clones has improved, it is still not near the quality of most non-infringing cartridges, regardless of whether they are compatibles, remans, or OEM products.

Recession Triggers Perfect Storm

The 2008 contraction in the global economy would forever change the Western cartridge remanufacturing industry. The global hardcopy market was growing prior to the recession, but, as detailed in this report, the remanufacturing industry in Europe and North America was under extreme pressure.

When the global economy tanked, demand for cloned all-in-one toner cartridges skyrocketed, which placed additional pressure on prices. End users throughout the world began scrutinizing their business costs. Many had not been aware of how expensive it was to print and were shocked when they learned how much they were paying to generate hardcopy. During the recession, organizations took steps to rein in their printing costs. In addition to placing restrictions on how much users could print, many companies looked for less-expensive consumables. With little knowledge of printing supplies and the pitfalls associated with clones, new customers were drawn to the tiny price tags on infringing compatibles, which had fallen to just a fraction of the prices of remanufactured and OEM cartridges.

Some Western remanufacturers began marketing clones just to respond to the surging demand. Others that may have preferred to stay on the right side of patent law found it increasingly difficult to remanufacture because the supply of empty cores dried up. Printing is tied to white-collar workers, and when unemployment surged in 2009 and 2010, print volumes plunged. Less printing resulted in less cartridge consumption and thus fewer cores. To fulfill their commitments to clients, many remanufacturers in the United States and Europe had no choice but to order clones.

Even after the recession, demand for clones remained strong. During the period between 2009 and 2012, shipments of infringing toner cartridges to Western markets kept climbing. Although core availability improved as the recession abated, the adverse impact of low clone pricing continued to be felt. Many remanufacturers felt they had to offer low-cost compatible cartridges along with their remanufactured cartridges or lose customers. The Internet emerged as a leading channel for ink and toner consumables, and clones were everywhere in cyberspace. New compatible toner cartridges priced at under \$10 were widely available through sites such as Amazon.com and eBay as well as an almost infinite number of small e-commerce sites.

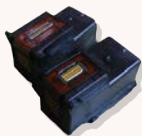
TRENDLINE 2008-12

Bring in the Clones

Until the recession forever changes the industry, the hardcopy market grows through 2008. In the wake of the economic downturn, consolidation accelerates and remanufactured cartridge prices tumble, forcing many beleaguered companies to change business models or exit the industry altogether.



Although cheap compatible cartridges reverse-engineered with little or no regard for IP have been around since the industry's earliest days, the availability of clones explodes in the West during the recession, which drives prices lower, and demand continues to grow through 2012.



Tied to white-collar employment, print volumes drop as unemployment surges in 2009 and 2010. Less printing results in less cartridge consumption and thus fewer cores, which forces many remanufacturers in the United States and Europe to order clones in order to fulfill their orders.



The Internet emerges as a leading channel for ink and toner consumables and clones are everywhere in cyberspace. Selling for under \$10, compatible toner cartridges become widely available through Amazon.com and eBay as well as an almost infinite number of small e-commerce sites.



In addition to pushing prices even lower, the growing demand for clones results in an uptick in lawsuits for third-party cartridge makers and sellers worldwide. The OEMs, along with the authorities in Europe and the United States, step up IP enforcement.



As one might expect, the growing demand for clones led to an uptick in lawsuits alleging patent infringement against third-party cartridge makers and sellers following the recession. Canon, which manufactures HP's LaserJet printer engines and toner cartridges, initiated successful litigation in various Western markets, including the United States and Europe. Other OEMs that market printers featuring all-in-one cartridges have also taken legal action to defend their IP, including Lexmark in the United States and Samsung in Europe. Authorities in Europe and the United States have also stepped up enforcement of OEMs' IP. The industry has experienced a dramatic uptick in U.S. Customs officials excluding and seizing cloned cartridges at the country's ports. The European authorities also have become quite active and have raided booths at certain trade shows and seized infringing products. (For more details about significant lawsuits, see Appendix 2 on pages 18-35.)

There has been some good news of late for remanufacturers and companies producing non-infringing cartridges. Over the past couple of years, many European and North American office-equipment dealers and MPS providers servicing higher-volume customers have moved away from clones and are using more non-infringing new compatibles and remanufactured cartridges. Companies that rely on flawless printing understand that while clones may be cheap, infringing compatibles provide little to no margin opportunities if they fail frequently or deliver terrible image quality. In addition to performance issues, there are supply-chain risks associated with peddling infringing cartridges, including the risk of being named in a patent-infringement lawsuit or having infringing cartridges seized by the authorities in countries where patent protections are enforced. Employing new go-to-market strategies and marketing programs, OEMs have also successfully put more pressure on clone makers and regained some market share.

While some industry players have turned away from clones, pervasive clone availability continues to dog the remanufacturing industry in the West. Static Control Components, a parts supplier to the remanufacturing industry, recently released numbers indicating that each month 1 million remanufactured toner cartridges enter the market in the United States compared to 1.4 million new compatibles. The situation is worse in Europe, with 1.8 million remanufactured toner cartridges hitting the market each month compared to 2.7 million new-build cartridges. Some consumers obviously still find the incredibly low clone prices irresistible

Faced with more clones and a smaller market, even some of the Western remanufacturing industry's most established players have struggled to survive

regardless of the risks. The situation is even worse in certain emerging markets where patent protections are not enforced or don't exist. In these regions, clones can command as much as 70 percent of the market.

Market Transformed

The recession fundamentally transformed the market, and many of the changes appear to be permanent. Home and office users have reevaluated their need for printed materials, and printing in neither the home nor the office has recovered to pre-recession levels. The severe cost-cutting measures embraced during the recession taught end users not to instinctively push the "print" button, especially in the office. Similarly, OEMs have rolled out new programs to help customers print more efficiently. The advent of new mobile devices not available before the recession, including smartphones and tablets, have allowed for more electronic-based information sharing, further reducing the need for certain paper documents.

Faced with more clones and a smaller market, even some of the Western remanufacturing industry's most established players have struggled to survive, including firms like LMI and Turbon. Ink cartridge remanufacturers have been hit particularly hard as home printing dropped, and well-known inkjet remanufacturers such as Legacy Imaging closed up shop.

While Western firms struggle, the third-party supplies industry in China is booming. Thousands of factories producing non-OEM cartridges are spread across China's Eastern provinces from Liaoning in the north to Guangxi just south of Guangzhou, as well as in clusters in more central Chinese provinces such as Hebei, Hubei, and Sichuan, and in and around the capital city of Beijing.

The southern port city of Zhuhai in Guangdong Province is the largest third-party cartridge manufacturing center in China. According to data from the Chinese government, approximately 700 registered companies that produce third-party supplies are located in Zhuhai. In 2015, Chinese authorities claimed Zhuhai produced 70 percent of the world's printer ribbons, 60 percent of all the third-party ink cartridges consumed globally, and 35 percent of the world's remanufactured toner cartridges. Although no data was presented regarding compatible cartridges, most Chinese firms in Zhuhai produce them. According to the local Zhuhai government, the printing consumables exported by this one city have a retail value of over \$7 billion and they are shipped to more than 100 countries across the world.

Although the Chinese industry is currently fragmented, there are signs that consolidation is underway. Over the past two years, some of the larger Chinese firms, including Hubei Dinglong Company and Ninestar Corporation, have begun snapping up the competition. These firms and several other large enterprises within China's third-party supplies industry have gone public and have leveraged their new-found inflows of capital to purchase competing companies. A couple of these large firms have purchased Western companies. Perhaps the most notable example is Apex Technology, a chip vendor that is affiliated with Ninestar, and its 2016 purchase of printer OEM Lexmark International.

TRENDLINE 2013-18

More of the Same

The industry has been transformed as home and office users reevaluate their need for printed materials. While print is far from dead, post-recession requirements for hardcopy have changed as end users embrace more electronic media.



In the contracting market, most Western remanufacturers continue to struggle, but the third-party supplies industry in China is booming. Today, China is home to the largest number of third-party supplies manufacturers in the world and thousands of factories are currently producing non-OEM cartridges.

Although the industry in China is robust, it is feeling the adverse effects of overcapacity and margin erosion as unit shipments climb while revenue falls.

The Chinese industry is currently fragmented, but there are signs of consolidation. The industry is also acquiring business outside of China.



Demand for clones in the West has flattened due to concerns about quality and



availability among European and North American dealers and other firms servicing higher-volume customers.

Demand for clones continues to grow in emerging markets, thus fueling production in many Chinese factories.

It is unlikely that the global remanufacturing industry will maintain its current roster of about 10,000 firms. By 2020, the total number will drop by a third, with much of the consolidation happening in China.



Although the industry in China is robust, it is feeling the adverse effects of overcapacity, and those effects will worsen. Our research indicates that while the production of cartridges in China continues to grow, the products are growing less profitable. The compound annual worldwide growth of Chinese third-party ink cartridge unit shipments fattened between 2010 and 2015 to about 2.9 percent, while shipments of toner cartridges grew at a rate of nearly 25 percent. Revenue growth is not keeping pace with shipments, however, which suggests that Chinese firms are destined to face the same margin compression that plagued Western firms for the past decade. According to our research, worldwide sales of third-party ink cartridges produced in China grew at about 2 percent for the period we examined, while worldwide revenue from non-OEM toner cartridges made in China increased by only about 7.5 percent.

The Remanufacturing Industry Going Forward

We expect that the ranks of the global third-party supplies industry will continue to thin. The number of firms that make up the remanufacturing industry in North America has dropped from 4,500 at its peak to fewer than 750 today. It is dominated by one leviathan, Clover, which has over \$1 billion in annual sales. Given that most players in the United States (except for LMI) have annual revenue well below \$100 million, we don't expect to see second-tier U.S. remanufacturers succeed in taking away share from Clover. While the European third-party supplies industry isn't quite as homogenous as the U.S. industry, it is more consolidated than it has ever been. Today, only a handful of companies control most of the markets in Europe, and we expect to see even fewer European companies as M&A activity continues in the region.

China will remain the most dynamic part of the industry for the foreseeable future. The consolidation of China's third-party supplies industry should allow it to continue to grow sales and the number of cartridges it manufactures in the short term. A more consolidated industry will be better positioned to pursue foreign markets with both infringing and non-infringing new-built cartridges as well as with remanufactured products. Larger multinational players will emerge from China with product lines tailored for specific regional markets, offering less expensive clones to customers for whom price is paramount and in markets where IP protections are lax or not enforced. These large multinational companies will also have the non-infringing compatibles and remanufactured cartridges required in markets where customers are more finicky about performance and authorities and patent holders are diligent about enforcing patent rights.

Moving into the next decade, we expect that the number of remanufacturers that make up the global industry will drop by at least a third, with much of that consolidation happening in China

While China's third-party supplies industry will grow by penetrating new markets, the days of the industry's perpetual rapid growth are coming to an end. There is simply too much production capacity in China, and this includes finished cartridges as well as raw materials. As the industry more fully penetrates the last emerging markets, organic growth will slow for the Chinese over the next five years. During this time, China's overcapacity will further erode pricing and make the urge to merge irresistible.

U.S. remanufacturers are facing a new threat to their business from overseas. Certain restrictions on non-OEM cartridges entering the United States have gone away as a result of recent changes in U.S. patent law. This will make it easier for third-party cartridges from abroad to enter the country. We expect that greater volumes of lower-priced products will soon be arriving at U.S. ports, putting U.S. remanufacturers at risk of losing even more share to inexpensive imports. While it is still too early to accurately gauge the long-term impact, many are concerned that the new U.S. patent laws may trigger even more price erosion and force third-party supplies vendors into a race to the bottom for prices. Because the new rules do not change the central IP issues that surround clones, it remains unclear how impactful the new patent laws will be on the importation of infringing goods. It is clear, however, that restrictions on all cartridges made overseas will ease.

Although it is a recent trend, we anticipate that Chinese companies will continue to look for acquisition targets in Western markets. Doing business in the West will be challenging for the Chinese, but it will make sense for Chinese companies to be able to produce goods closer to the markets they service. There are plenty of small- to medium-sized firms that would presumably be happy to sell, and there are larger acquisition targets should the Chinese be interested, and we suspect that they are. Pelikan Hardcopy, a venerable European giant, has struggled for years, moving much of its production to Asia and cutting its European workforce. Pelikan recently licensed its non-OEM cartridge business to the Chinese supplies vendor Print-Rite.

Despite the continued contraction in the industry, we estimate that approximately 10,000 remanufacturers continue to do business worldwide. As a result, competition will remain stiff for third-party supplies firms in most markets around the globe. Western remanufacturers should expect little relief as Chinese companies expand production into Western markets and take share from the smaller players in Europe and North America. Facing such stiff competition, it seems unlikely that the number of remaining remanufacturers will total 10,000 in 2020. Moving into the next decade, we expect that the number of remanufacturers that make up the global industry will drop by at least a third, with much of that consolidation happening in China.

Appendix 1: Types of Cartridges

OEM Cartridges

These cartridges are premium products that cost more than other types of cartridges but offer the best performance. OEMs normally support their performance claims for these products by offering customers refunds or replacements for defective cartridges.

In addition to offering high-quality performance, OEM cartridges are the safest type of cartridge for channels to market and for customers to use. The products are built by reputable companies that use their own patented technology and must meet regulatory requirements. For example, the factories where OEM products are made conform to industrial hygiene codes. The finished cartridges ship with safety data sheets, which inform end users of exactly what they're handling. OEM cartridges also have certain environmental benefits, as OEMs offer return programs to collect empties and increasingly manufacture cartridges using some recycled materials.

Remanufactured Cartridges

Remanufactured cartridges are based on exhausted OEM cartridges that are refurbished with new parts and refilled with ink or toner and are marketed specifically as “remanufactured” products. The spent cartridge cores used to manufacture these cartridges are acquired through programs established by retailers, empties brokers, and others. Remanufacturers market their products as delivering near-OEM quality at a lower price point and having less of an adverse environmental impact because they reuse spent cores. Reputable remanufacturers usually back their price/performance claims with refund or replacement guarantees and will indemnify customers against lawsuits.

There are other benefits beyond low costs and “green” attributes associated with remanufactured cartridges. These cartridges are often produced at regional factories, where remanufacturers employ local workers and the plants must comply with all local industrial hygiene standards. Like OEM cartridges, most remanufactured products also meet all the local regulatory requirements, including the use of safety data sheets and package labeling.

There are certain risks that come from marketing remanufactured cartridges. Under the patent laws practiced in most countries, remanufacturing is generally permitted. Companies must ensure, however, that all parts and materials used during the refurbishing process do not violate any OEM IP in order to avoid lawsuits. Many remanufacturers and their channel partners have been dragged into court and smacked with onerous penalties because they unwittingly used infringing parts. Remanufactured cartridges are also only as good as the core they are based on, so performance can be an issue if a damaged or otherwise inferior empty is refurbished.



New-Build Compatibles

Non-infringing compatibles

These are cartridges that are made with new parts that do not infringe any OEM intellectual properties. Certain cartridges contain only ink or toner and do not feature the highly patented imaging technologies found in other cartridges. Brother and OKI toner cartridges, for example, are often containers of toner without an imaging drum and other high-tech components. Third-party cartridge manufacturers are able to reverse-engineer these designs and produce brand new cartridges without infringing on any intellectual property. The same is true with certain ink cartridges that do not house the print heads that jet ink onto a sheet of paper. These ink containers can be reverse-engineered rather easily without violating OEM IP.

It is difficult to gauge whether cartridges marketed as non-infringing compatibles are truly “IP-free.” IP protections vary depending on the laws of the country where the products are marketed. As a result, a new-build non-infringing compatible cartridge may be free of any IP protections in one market, while it infringes patents, copyrights, etc., in others. Moreover, infringing compatibles are sometimes marketed as being IP-free, which undermines the value that customers may place on products that are engineered to be non-infringing.

Although new-build compatible cartridges can provide substantial savings, they can have a downside when compared to the equivalent OEM or remanufactured product. IP-free new builds lack the “green” credentials offered by re-furbs and their quality ranges widely from poor to good. Unfortunately, new-build non-infringing cartridges lack the refund/replacement guarantees or indemnification offered by OEMs and remanufacturers. Because most non-infringing compatible cartridges are manufactured in regions where industrial hygiene is lax and product safety is not a concern, there can be issues with the production as well as with the finished goods themselves.

Infringing compatibles

This is a class of compatible cartridges that have been reversed-engineered from original OEM cartridges. Often referred to as “clones,” these cartridges are inexpensive to produce because they are simply copied with minimal R&D investments and require no empty cores. Unlike OEM and remanufactured cartridges, some clones are illegal to sell in countries that enforce IP protections and they are at the center of a number of OEM lawsuits.

While clone manufacturers claim their cartridges provide substantial savings over OEM and competing third-party products, the quality is usually low. They perform poorly and are unlikely to come with guarantees or indemnification. Because clones are newly manufactured, they also offer no environmental benefits. With no transparency regarding manufacturing practices or policies, there is no way to gauge the health and safety risks that come with clones and their production. They can be made of dangerous materials in factories with miserable working conditions and present a danger to the workers who produce them as well as to end users.

Clones pose the greatest threat to the remanufacturing industry and its channel partners. Cloned cartridges are often falsely marketed as refurbished cartridges but are sold a fraction of the price of an actual reman. Companies marketing legitimately remanufactured cartridges simply cannot compete with the price of clones. Unknowing remanufacturers also run the risk of marketing products based on empty infringing clones and unwittingly infringe OEM IP. Clones place importers, empties brokers, distributors, sellers, and end users at risk of violating OEM IP and expose them to potential lawsuits.

Appendix 2: Recent Significant Lawsuits

Appendix 2a and 2b

Lawsuits Filed by Epson Alleging Counterfeiting

| Defendant | Venue | Patents | Date filed | Most recent action | Status |
|--|--|---|------------|--------------------|---|
| InkSystem LLC, AF LLC, ART LLC, Lucky Print LLC, Inkredible LLC, Andriy Kravchuk, Igor Bielov, Artem Koshkalda, Vitalii Maliuk, and certain unidentified ("John Doe") defendants | U.S. District Court for the District of Nevada | Manufacturing, distributing, and selling counterfeit Epson-branded ink cartridges | Sept. 2016 | Pending | According to Epson, U.S. Marshals and representatives from the firm raided locations in Reno, NV, and seized some 14,000 counterfeit ink cartridges and components to make more. The defendants were accused of trademark counterfeiting, trademark infringement, unfair competition, and false advertising. A preliminary injunction was issued in Oct. 2016 enjoining the defendants from manufacturing, promoting, and marketing counterfeit cartridges. Epson later subpoenaed defendants' sales activity from Amazon.com. Court also issues temporary restraining order and seized defendants' property. |

Lawsuits Filed by Epson Alleging Patent Infringement

| Defendant | Venue | Patents | Date filed | Most recent action | Status |
|--|--|---|------------|--------------------|--|
| Acujet, Apex Distribution, Artech, Butterfly Print Image Corp., Dataproducts, Glory South Software Manufacturing, Ink Lab, Ink Tec America, Ink Tec Corp., Inkjetwarehouse.com, Master Ink Co., Mipo America, Mipo International, MMC Consumables, Nectron International, Ninestar Image Co., Ninestar Technology Company, Rhinotek Computer Products, Ribbon Tree (USA) Trading Co., Townsky, Tully Imaging Supplies, Wellink Trading Co., and Zhuhai Gree Magneto-Electric Co. | U.S. District Court for the District of Oregon and U.S. International Trade Commission (ITC), investigation 337-TA-565 | Infringement of U.S. patents 5,615,957 ('957), 5,622,439 ('439), 5,158,377 ('377), 5,221,148 ('148), 5,156,472 ('472), 5,488,401 ('401), 6,502,917 ('917), 6,550,902 ('902), 6,955,422 ('422), 6,193,364 ('364), 6,550,901 ('901), 6,916,089 ('089), and 6,948,804 ('804) | Feb. 2006 | Feb. 2012 | Epson alleged in complaints filed in federal court and with the U.S. ITC that 24 firms marketed products infringing various U.S. patents. Epson asked the ITC to stop the respondents from marketing infringing cartridges in the United States and sought damages in federal court. Most defendants either settled with Epson or defaulted within a year or two of the matter being filed, but several companies including Ninestar and Dataproducts continued to litigate the case for many years. In October 2007, the ITC awarded Epson a general exclusion order (GEO) and barred the importation of the products that infringe the Epson patents. The ITC also issued cease-and-desist orders to Ninestar, Dataproducts, and others. Ninestar appealed the ITC orders to the Federal Circuit in Washington, DC, which upheld the ban in 2009. (Note: In 2017, Ninestar asked the ITC to review the ban in light of recent SCOTUS rulings.) After the ITC issued its orders, Customs agents seized infringing products and some of the seizures resulted in steep fines again Ninestar, Mipo, and Cana-Pacific. |

Continued on next page

Lawsuits Filed by Epson Alleging Patent Infringement (continued)

| Defendant | Venue | Patents | Date filed | Most recent action | Status |
|--|---|---|------------|--------------------|--|
| Cartridges Are Us, E-Babylon, Linkyo Corp., and PrintPal | U.S. District Court for the District of Oregon | Infringement of U.S. patents 5,615,957 ('957), 5,622,439 ('439), 5,158,377 ('377), 5,221,148 ('148), 5,488,401 ('401), 6,502,917 ('917), 6,955,422 ('422), 7,008,053 ('053), 7,011,397 ('397), 6,193,364 ('364), 6,550,901 ('901), 6,916,089 ('089), 6,948,804 ('804), 7,018,030 ('030), 7,152,965 ('965), 6,834,945 ('945), 6,832,830 ('830), and 7,125,100 ('100) | June 2007 | Feb. 2012 | Epson expanded its legal campaign in the U.S., primarily focusing on resellers marketing compatible cartridges sourced from Ninestar. Seeking a permanent injunction and compensatory damages, the OEM sued four distributors, accusing them of infringing various U.S. patents. E-Babylon settled in 2007 but the other defendants, represented by Ninestar's legal team, continued to fight with Epson until 2012, when Ninestar settled the litigation that had been ongoing since 2006. |
| Interlasser S.A. de C.V., Computación Administrativa y Diseño S.A. de C.V., and Memomedia S.A. de C.V. | Instituto Mexicano de la Propiedad Industrial (a.k.a., Mexican Industrial Property Institute) | Unknown | Aug. 2007 | Unknown | Epson was awarded preliminary injunctions in Mexico against three distributors for infringing its patents. Searching for infringing products, the Mexican trademark and patent office inspected the premises of three defendants and issued the injunctions. |
| Cana-Pacific Ribbon, Mipo International, and Ninestar Technologies | U.S. ITC | Violating ITC orders stemming from 337-TA-565 investigation | May 2008 | May 2013 | Alleging the defendants continued to import infringing ink cartridges into the U.S., Epson filed separate enforcement complaints with the ITC in 2008. In 2009, the ITC found that Ninestar's U.S. subsidiaries violated ITC orders and recommended a \$20.5 million fine for Ninestar's violations, which the commission later reduced to \$11.1 million in August 2009. The ITC judge overseeing the case also recommended a \$9.7 million fine against Mipo and \$700,000 fine against Cana-Pacific. Ninestar's fine was not overruled by the federal appeals court and the U.S. Supreme Court declined to hear the case. While the courts upheld the fines, it is unclear if any of the defendants actually paid them. |

Continued on next page

Lawsuits Filed by Epson Alleging Patent Infringement (continued)

| Defendant | Venue | Patents | Date filed | Most recent action | Status |
|--|--|---|------------|--------------------|--|
| Acecom Inc., Comptree, Inkjetmadness.com, and Media Street Inc. | U.S. District Court for the District of Oregon | Infringement of U.S. patents 5,615,957 ('957), 5,622,439 ('439), 5,158,377 ('377), 5,221,148 ('148), 5,156,472 ('472), 5,488,401 ('401), 6,502,917 ('917), 6,550,902 ('902), 6,955,422 ('422), 6,193,364 ('364), 6,550,901 ('901), 6,916,089 ('089), and 6,948,804 ('804) | May 2008 | Feb. 2012 | Epson alleged that the four defendants were selling new or refilled ink cartridges that infringe various Epson patents. The OEM sought a permanent injunction and an undisclosed amount in compensation. While Media Street agreed to a consent judgment and permanent injunction in 2008, Acecom Inc., Comptree, and Inkjetmadness.com did not settle with Epson until Ninestar settled with the OEM in 2012. The court then issued consent judgment and permanent injunctions against further infringement. |
| Abacus 24-7, Eforcity Corp., Green Project, R&L Imaging Group, Inc., and XP Solutions Properties | U.S. District Court for the District of Oregon | Infringement of U.S. patents 5,615,957 ('957), 5,622,439 ('439), 5,158,377 ('377), 5,221,148 ('148), 5,488,401 ('401), 6,502,917 ('917), 7,008,053 ('053), 7,011,397 ('397), 6,193,364 ('364), 6,550,901 ('901), 6,916,089 ('089), 6,948,804 ('804), 7,018,030 ('030), 7,152,965 ('965), 6,834,945 ('945), 6,832,830 ('830), and 7,125,100 ('100) | April 2009 | Feb. 2012 | In this lawsuit, which is related to the infringement suits filed by Epson in 2006 to 2008, Epson accused the defendants of importing and marketing products in the U.S. that violated its patents. It appears that at least some of the defendants were Ninestar customers. Eforcity and Green Project reached separate settlements with the OEM, while the remaining defendants settled when Ninestar settled its case in 2012. |
| Dynamic Cassette International Limited (DCI) | High Court of Justice (United Kingdom) | Infringement of patents | April 2011 | Aug. 2013 | Although details about the case were few, Seiko Epson announced that it filed a patent-infringement lawsuit against DCI. With monthly production capacity of 2 million compatibles, 1 million remanufactured cartridges, and 500,000 refill kits, DCI was one of the largest producers of Epson compatibles in Europe. DCI settled with Epson but did not disclose the terms of the agreement. The OEM did acknowledge in a press release that DCI has ceased to manufacture compatible cartridges for Epson printers. DCI continues to market refilled Epson tanks. |

Continued on next page

Lawsuits Filed by Epson Alleging Patent Infringement (continued)

| Defendant | Venue | Patents | Date filed | Most recent action | Status |
|--|--|---|------------|--------------------|---|
| Aomya Printer Consumables (Zhuhai) Co., Ltd.; Chanchen Co., Ltd.; Dongguan OcBestjet Printer Consumables Co., Ltd.; Huebon Co., Ltd.; InkPro2day, LLC; Kingway Image Co., Ltd.; Nano Business and Technology, Inc.; OcBestjet Printer Consumables (HK) Co., Ltd.; Orink Infotech International Co., Ltd.; Ourway Image Co., Ltd.; Shanghai Orink Infotech International Co., Ltd.; Yotat Group Co., Ltd.; Zhuhai Chinamate Technology Co., Ltd.; Yotat (Zhuhai) Technology Co., Ltd.; Zhuhai Nano Digital Technology Co., Ltd.; Zhuhai National Resources & Jingjie Imaging Products Co., Ltd.; Zhuhai Richeng Development Co., Ltd.; Zhuhai Rich Imaging Technology Co., Ltd.; and Zinyaw LLC | U.S. ITC, investigation 337-TA-946 | Infringement of U.S. patents 8,366,233 ('233), 8,454,116 ('116), 8,794,749 ('749), 8,801,163 ('163), and 8,882,513 ('513) | Dec. 2014 | May 2016 | After Nano Business and Technology and Zhuhai Nano Digital Technology settled and all the other respondents defaulted, the ITC in May 2016 determined Epson's patents were infringed and a general exclusion order barring the importation and sale of any inkjet cartridges or components that infringe the '233, '116, '749, '163, and '513 patents, which relate to both on-carriage and off-carriage ink tanks and their chipsets. |
| Nano Business and Technology | U.S. District Court for the District of Oregon | Infringement of U.S. patents 6,502,917 ('917) and 8,794,749 ('749) | Nov. 2016 | May 2017 | The defendant was alleged to have sold infringing compatible Epson ink tanks on the Amazon Marketplace, eBay, and at www.nanodigitalink.com. Epson further alleged that the defendant breached a settlement that resolved matters raised in an earlier ITC 337 investigation, which resulted in a GEO. The company was a respondent in Epson's 337-TA-946 investigation before the ITC along with Zhuhai Nano Digital Technology Co., Ltd., the Zhuhai, China-based manufacturer and exporter of the third-party inkjet cartridges sold by Nano Business. |
| HT Tech, Inc., HT Imaging Inc., InkJet2U, Houses Investing of Florida, Houses Investing, Shoppers Smart, and Worf Corp. | U.S. District Court for the District of Oregon | Infringement of U.S. patents 6,502,917 ('917) and 8,794,749 ('749) | Dec. 2016 | May 2017 | Defendants are accused of selling infringing products at online marketplaces like Amazon and eBay. The lawsuits seek a declaration that Epson's patents are valid and enforceable and were willfully infringed by the defendants. In addition to preliminary and permanent injunctions, the OEM is seeking treble damages as well as interest, attorneys' fees, and court costs. Shoppers Smart settled in May 2017. |

Continued on next page

Lawsuits Filed by Epson Alleging Patent Infringement (continued)

| Defendant | Venue | Patents | Date filed | Most recent action | Status |
|--|--|--|------------|--------------------|---|
| Advance Image Manufacturers, Inc. (AIM), Gaea Supplies Corp., OW Supplies Corp. and Smart and Eazy Corp., and TA Trix USA Inc. | U.S. District Court for the District of Oregon | Infringement of U.S. patents 6,502,917 ('917) and 8,794,749 ('749) | March 2017 | July 2017 | Epson sued the three defendants for infringing the '749 and '917 patents. They are alleged to have sold infringing compatible Epson ink tanks on the Amazon Marketplace as well as other websites, such as www.advanceimage.com and www.neximaging.com as well as eBay and Newegg. TA Trix settled in June 2017 and OW Supplies and Smart and Eazy followed in July 2017. |
| Prinko Image Co. (USA), Inc. and Soldcrazy USA LLC | U.S. District Court for the Central District of California | Infringement of U.S. patents 6,502,917 ('917) and 8,794,749 ('749) | June 2017 | Pending | Epson sued the three defendants, alleging they sold infringing compatible Epson ink tanks on the Amazon Marketplace as well as other websites, including Walmart.com . The two firms were issued a seizure-and-forfeiture order for trying to import cartridges that infringed Epson's 337-TA-565 GEO. Epson says they continue to import infringing cartridges, despite notifications from Customs and the seizure-and-forfeiture order issued to each company by the ITC, and that the defendants were aware of at least the '917 patent so the infringement is willful. |

Appendix 2c

Lawsuits Filed by HP Alleging Patent Infringement

| Defendant | Venue | Patents | Date filed | Most recent action | Status |
|--|---|---|------------|--------------------|--|
| Comptree Ink d/b/a Meritline, ABCInk, EZ Label, and CDR DVDR Media; InkPlusToner.com; Mextec Group Inc. d/b/a Mipo America Ltd.; Mipo International Ltd.; Ourway Image Co., Ltd.; Shanghai Angel Printer Supplies Co. Ltd.; Shenzhen Print Media Co., Ltd.; SmartOne Services LLC d/b/a InkForSale.net; Tatrix International; Zhuhai Gree Magneto-Electric Co., Ltd.; and Zhuhai National Resources & Jingjie Imaging Products Co., Ltd. | U.S. International Trade Commission (ITC), investigation 337-TA-691 | Infringement of U.S. patents 6,089,687 ('687) and 6,264,301 ('301) | Sept. 2009 | Jan. 2011 | HP split this investigation into two. The patent ultimately asserted in the 691 investigation is shown at left; two other patents originally asserted in the 691 investigation were then asserted in the 730 investigation. ITC issued a general exclusion order (GEO) in Jan. 2011 barring the importation and sale of any inkjet cartridges or components that infringe the '687 and '301 patents, which relate to the chipset used on certain HP individual ink tanks. |
| Mextec Group Inc. d/b/a Mipo America Ltd.; Ourway Image Co., Ltd.; Shanghai Angel Printer Supplies Co. Ltd.; Shenzhen Print Media Co., Ltd.; Tatrix International; and Zhuhai National Resources & Jingjie Imaging Products Co., Ltd. | U.S. ITC, investigation 337-TA-730 | Infringement of U.S. patents 6,959,985 ('985) and 7,104,630 ('630) | June 2010 | Nov. 2011 | This ITC investigation began as an offshoot of the 691 investigation, but HP later split the 691 investigation into two, with the 691 focusing on two patents and the 730 investigation focusing on the two patents shown at left. ITC issued a GEO in Nov. 2011 barring the importation and sale of any inkjet cartridges or components that infringe the '985 and '630 patents, which relate to the physical design of certain HP ink tanks and the way these tanks align with and connect to the printer. |
| Asia Pacific Microsystems, Inc.; MicroJet Technology Co., Ltd.; Mextec d/b/a Mipo America Ltd.; Mipo Technology Limited; Mipo Science & Technology Co., Ltd.; PTC Holdings Limited; and SinoTime Technologies, Inc. d/b/a All Colors | U.S. ITC, investigation 337-TA-723 | Infringement of U.S. patents 6,234,598 ('598), 6,309,053 ('053), 6,398,347 ('347), 6,412,917 ('917), 6,481,817 ('817), and 6,402,279 ('279) | May 2010 | Oct. 2011 | In Oct. 2011, the ALJ found PTC Holdings and MicroJet Technology liable for direct infringement, MicroJet Technology liable for induced infringement, and APM liable for contributory infringement. ITC issued a GEO on the '598, '053, '347, '817, and '279 patents, which related to integrated print head inkjet cartridges. |
| Multilaser Industrial | State Court of São Paulo (Brazil) | Infringement of HP integrated print head inkjet cartridge patents in Brazil | April 2011 | May 2012 | This is HP's first inkjet patent-infringement suit in Brazil. In May 2012, HP announced an amicable settlement under which Multilaser agreed to stop selling infringing cartridges and reimburse HP for part of its litigation costs. |

Continued on next page

Lawsuits Filed by HP Alleging Patent Infringement (continued)

| Defendant | Venue | Patents | Date filed | Most recent action | Status |
|--------------------------|---|---|------------|--------------------|---|
| Rio Branco Ltd. | State Court of São Paulo (Brazil) | Infringement of HP integrated print head inkjet cartridge patents in Brazil | April 2011 | Sept. 2012 | In Sept. 2012, HP announced an amicable resolution under which Rio Branco agreed to stop selling infringing cartridges and reimburse HP for part of its litigation costs. HP also announced similar out-of-court agreements with Canal Verde, Ecologic Technologica, Edeltec, Extralife Industria E Comercio Ltda., Mipo Technology Ltd., SOS Cartuchos, and Suprijet. |
| Action S.A., and AB S.A. | Unnamed court in Poland | Infringement of HP integrated print head inkjet cartridge patent(s) | 2012 | Jan. 2014 | In Jan. 2013, HP announced settlements with the two defendants under which the firms agreed to stop selling certain compatible inkjet cartridges in Poland, destroy remaining inventory, and pay HP a portion of its litigation costs. In Jan. 2014, HP announced that Action S.A. was not living up to its agreement and it had to take additional action to enforce settlement terms. |
| Black Point S.A. | Wroclaw Circuit Court, appeals court (Poland) | Infringement of HP integrated print head inkjet cartridge patent(s) | Jan. 2013 | Oct. 2016 | In April 2016, HP announced that the court found that the defendant infringed and ordered Black Point to pay damages. Both parties appealed—HP to get more damages and Black Point appealing the finding it had infringed. The appellate court upheld the lower court's ruling. |
| LD Products | U.S. District Court for the Northern District of California | False advertising and unfair competition | Feb. 2013 | Oct. 2013 | HP sued LD for selling new-built inkjet and toner cartridges as remanufactured. LD counterclaimed that HP was libelous for engaging in advertising that made false statements and claims regarding the quality, performance, and environmental benefits of remanufactured cartridges. The parties announced a settlement in Oct. 2013. |

Continued on next page

Lawsuits Filed by HP Alleging Patent Infringement (continued)

| Defendant | Venue | Patents | Date filed | Most recent action | Status |
|--|--|--|------------|--------------------|---|
| BestUse GmbH | Unnamed court in Germany | Infringement of HP integrated print head inkjet cartridge patent(s) and ink tank patents, falsely selling new-built cartridges as remanufactured | 2013 | Jan. 2014 | After BestUse refused to defend itself, the court found in HP's favor and ordered BestUse to pay HP's legal costs and turn over information about its supplier. |
| ABC Data S.A., Komputronik S.A., Modecom S.A., Praxis S.A., Scot Sp.z o.o., and Kris Krzysztof Muszalski | Unknown, most likely never made it to court (Poland) | Infringement of HP integrated print head inkjet cartridge patent(s) | 2013 | Jan. 2014 | After being contacted by HP, defendants all agreed to settlement agreements under which they agreed to cease selling infringing products, destroy remaining inventory, and reimburse HP for its legal costs. |
| Ninestar Image Tech Limited; Ninestar Technology Co., Ltd.; and Apex Microelectronics Co., Ltd. | U.S. District Court for the Northern District of California | Infringement of U.S. patents 6,089,687 ('687), 6,264,301 ('301), and 6,454,381 ('381) | Oct. 2014 | May 2015 | HP claimed that the defendants' chips and HP-compatible ink tanks infringed its patents, in violation of both the 691 GEO and a prior 2007 settlement agreement with Ninestar. In May 2015, HP voluntarily dismissed the complaint after the parties reached a settlement agreement. |
| Digital Revolution, d/b/a 123inkt.nl | District Court of The Hague, The Hague Court of Appeal (the Netherlands) | Three separate cases, including two claiming infringement of HP ink tank patents and one over new-built cartridges sold as rebuilt | 2014 | May 2017 | HP won a favorable judgment on the complaint related to new-built cartridges falsely sold as rebuilt, and defendant had to post a notice on its website. HP dropped one of the patent-infringement complaints after Digital Revolution began selling a redesigned version of the cartridges in question. In Nov. 2015, the court found that one of HP's European patents, EP 2170617, should be invalidated. HP appealed. In May 2017, the appellate court upheld the lower court's decision invalidating one of the HP patent claims and finding Digital Revolution did not infringe the other claims. |
| Tintas y Toner Shop Ink, S.L.U.; Vasco Informática, S.L.; and nine other defendants | Commercial Court No. 5 in Barcelona (Spain) | Infringement of HP integrated print head inkjet cartridge patent(s) | 2014 | Apr. 2016 | In April 2016, the court found that all 11 defendants had infringed HP's patents. The defendants were ordered to cease the sale of infringing products and awarded HP damages. |

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Lawsuits Filed by HP Alleging Patent Infringement (continued)

| Defendant | Venue | Patents | Date filed | Most recent action | Status |
|--|--|--|------------|--------------------|---|
| Chameleon S.A., ePrimo.pl Sp. z o.o., Rafcom Rafał Ziółkowski, and Telforceone S.A. | Unknown, may have never made it to court (Poland) | Infringement of HP integrated print head inkjet cartridge patent(s) and ink tank patents | 2014 | Jan. 2015 | In Jan. 2015, HP announced settlements with the four defendants in which they agreed to cease selling infringing products, destroy remaining inventory, and reimburse HP for its legal costs. |
| Speed Infotech Ltd. | Shanghai IP Court (China) | Infringement of HP integrated print head inkjet cartridge patent(s) | 2014 | Apr. 2016 | This case was notable because it was HP's first in China and the very first case filed with the Shanghai IP court. In April 2016, HP announced a court-mediated settlement with the defendant in which Speed agreed to cease the sale of infringing products both in China and in other countries where HP has patent protection. Speed also had to pay HP an undisclosed amount in compensation. |
| Jingying Technology | Shenzhen Intermediate Court (China) | Infringement of HP integrated print head inkjet cartridge patent(s) | 2014 | Unknown | Unknown status. |
| Aigo, Aigo Tech, and Aigo Tech Onsynk | Unnamed court in Barcelona (Spain), spread to courts in the Netherlands and Poland | Unknown | July 2015 | Unknown | The Guardia Civil seized infringing cartridges in Spain, sparking a criminal patent-infringement case in Spain. HP has since filed suit against Aigo-related entities in the Netherlands and Spain. HP has seen some wins in the Netherlands cases but saw a patent invalidated in Poland. The current status of all these cases is unknown. |

Appendix 2d

Lawsuits Filed by Lexmark Alleging Patent Infringement

| Defendant | Venue | Patents | Date filed | Most recent action | Status |
|---|---|---|-------------|--------------------|---|
| Acecom d/b/a Inksell.com, ACM Technologies, Chung Pal Shin d/b/a Ink Master, Alpha Image Tech and E-Toner Mart, Copy Technologies, C & R Services, Direct Billing International d/b/a OfficeSupplyOutfitters.com and The Ribbon Connection, Huizhou Jahwa Electronics Co., IJSS d/b/a TonerZone.com and Inkjet Superstore, Ink Technologies Printer Supplies d/b/a Ink Technologies LLC, Jahwa Electronics Co., Laser Toner Technology, Nano Pacific Corp., Nectron International, Ninestar Image Co., Ninestar Image Int'l, Ninestar Technology Company, Print-Rite Holdings Ltd., Quality Cartridges, Seine Image International Co., Union Technology Int'l, Virtual Imaging Products, and Ziprint Image Corp. | U.S. District Court for the Southern District of Ohio and U.S. International Trade Commission (ITC), investigation 337-TA-740 | Infringement of U.S. patents 5,337,032 ('032), 5,634,169 ('169), 5,758,233 ('233), 5,768,661 ('661), 5,802,432 ('432), 5,875,378 ('378), 6,009,291 ('291), 6,078,771 ('771), 6,397,015 ('015), 6,459,876 ('876), 6,816,692 ('692), 6,871,031 ('031), 7,139,510 ('510), 7,233,760 ('760), and 7,305,204 ('204) | August 2010 | Q3 2011 | After respondents either defaulted or settled with Lexmark, the ITC issued a general exclusion order (GEO) barring the importation and sale of any toner cartridges and components that infringe the asserted patents. In the Southern District of Ohio case, the original defendants agreed to a consent judgment and permanent injunction. |
| Blue Trading LLC, Core Servicios Informaticos S.I., Direct Billing International, Eco Service China Ltd., Eco Service Sp. Z o.o., ECOI US Supplies, Enviro Green Technologies, Exprint International, FBA Holding, Fuller International Corporation, Green Imaging Supplies, Green Project, Hock Group LLC, IJSS, Impression Products, Interseroh Product Cycle GmbH, K & W International Development, LD Products, LTS Consumables, MBC Trading, N & L Global Co., NGS S.A., Onlinetechstores.com, OW Supplies Corp., Prinko Image Co. (USA), Printronix Corporation, Recyca BVBA, Refiltone, Shanghai Orink InfoTech International Co., Sinotime Technologies, Standard Image USA, Tech Optics, Tesen Development (Hong Kong) Co. Ltd., TonerLand, Wal Group LLC, XSE Group, Zhuhai Aicon Image Co., and Zhuhai Richeng Development Co. | U.S. District Court for the Southern District of Ohio | Infringement of U.S. patents 5,337,032 ('032), 5,634,169 ('169), 5,758,231 ('231), 5,758,233 ('233), 5,768,661 ('661), 5,802,432 ('432), 5,875,378 ('378), 5,995,772 ('772), 6,009,291 ('291), 6,078,771 ('771), 6,397,015 ('015), 6,459,876 ('876), 6,487,383 ('383), 6,496,662 ('662), 6,678,489 ('489), 6,816,692 ('692), 6,871,031 ('031), 6,879,792 ('792), 7,139,510 ('510), 7,233,760 ('760), and 7,305,204 ('204) | H1 2012 | June 2014 | Starting in 2012, Lexmark began sending demand letters to companies warning them to settle or they would be named as "John Doe" defendants in the next phase of its Southern District of Ohio suit. Lexmark filed two amended complaints in 2013 naming the defendants at left; many others not named at left agreed to consent judgments and permanent injunctions before the court. All the defendants named in Lexmark's amended complaints ultimately settled, except for one—Impression Products. In June 2014, the judge issued a final judgment in Lexmark's favor, ruling that Impression infringed Lexmark's patents when it remanufactured toner cartridges using cores first sold outside the United States. However, the judge found in Impression's favor on another key issue, determining that the Return Program toner cartridges first sold in the U.S. that Impression remanufactured did not infringe because Lexmark had exhausted its patent rights in these cartridges. Both parties appealed to the Federal Circuit. |

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Lawsuits Filed by Lexmark Alleging Patent Infringement (continued)

| Defendant | Venue | Patents | Date filed | Most recent action | Status |
|---------------------|---|---|------------|--------------------|---|
| Impression Products | U.S. Court of Appeals for the Federal Circuit | Whether foreign sales of patented products and whether conditional sales exhaust U.S. patent rights | June 2014 | Feb. 2016 | After holding a rare <i>en banc</i> hearing in Oct. 2015, the Federal Circuit In Feb. 2016 ruled in Lexmark's favor on both key issues presented by this case: whether patentees retain patent rights in products first sold overseas and whether patentees retain patent rights in products sold with certain post-sale restrictions. Impression Products then appealed to the U.S. Supreme Court. |
| Lexmark | U.S. Supreme Court | Whether foreign sales of patented products and whether conditional sales exhaust U.S. patent rights | March 2016 | May 2017 | The U.S. Supreme Court took up its appeal. The U.S. DOJ weighed in as did dozens of amici. In May 2017, the Supreme Court found in Impression's favor and reversed the Federal Circuit's decision on both questions, determining that "a patentee's decision to sell a product exhausts all of its patent rights in that item, regardless of any restrictions the patentee purports to impose or the location of the sale." |

Appendix 2e

Lawsuits Filed by Samsung Alleging Patent Infringement

| Defendant | Venue | Patents | Date filed | Most recent action | Status |
|--|--|--|------------|--------------------|---|
| CMN PrintPool, HQ Patronen, Kolor Burotechnik, Nord-Toner, and other unnamed third-party cartridge sellers | District Court of Munich (Germany), Munich Court of Appeal (Germany) | Infringing European patents 1975744, 2357537, 2325701, and 2256559 | Nov. 2013 | April 2016 | Samsung was awarded preliminary injunctions against seven resellers in late 2013 and six more resellers in Aug. 2014. In Oct. 2015, Samsung announced that it won a patent-infringement lawsuit over the EP 1975744 patent against four resellers, who were ordered to stop selling the accused cartridges and recall those that had been distributed. In April 2016, Samsung said the Munich Court of Appeals determined that two resellers infringed the 2325701 and 2256559 patents; nine other resellers were found by the lower court to have infringed these same patents. |
| Digital Revolution (123inkt.nl), Maxperian, Print About, Yorcom Computers, and others | District Court of The Hague (the Netherlands) | Infringing European patents 2397914, 1975744, 2357537, 001200687, and 000853551, and potentially some others | Dec. 2013 | Jan. 2017 | Initially, the district court awarded Samsung a preliminary injunction against Digital Revolution and Maxperian, while Samsung withdrew its complaint against Yorcomm and no injunction was issued to Print About. In Nov. 2014, Digital Revolution (joined by Maxperian, A1 Interflow, and Dark Stone) saw a favorable summary judgment that found one of the Samsung patents, 2397914, would likely be found invalid. However, in Nov. 2016, on appeal, the Court of the Hague found in Samsung's favor and determined that Digital Revolution and Maxperian had infringed four utility and design patents. Digital Revolution was also found guilty of misleading comparative advertising. Digital Revolution and Maxperian had to stop selling and recall the accused cartridges and post notices about the judgment on their websites. |
| Uprint | Demand letter (France) | Infringing European patents 2325701 and 2037327 | April 2014 | | Samsung warned the reseller it was infringing and demanded information about its supplier. |

Appendix 2f

Lawsuits Filed by Canon Alleging Infringement of Twisted Prism Gear Patents

| Defendant | Venue | Patents | Date filed | Most recent action | Status |
|---|---|--|------------|--------------------|--|
| Acecom d/b/a InkSell.com, Atman d/b/a pcRUSH.com, CAU Acquisition Company, Clover Holdings, Clover Technologies Group, Clover Vietnam, Dataproducts Imaging Solutions S.A., Dataproducts USA, Deal Express d/b/a Discount Office Items, Dexxon Digital Storage, Discount Office Items, Do It Wiser d/b/a Image Toner, E-Max Group d/b/a Databazaar.com, Green Project, GreenLine Paper Co., IJSS d/b/a TonerZone.com and InkJetSuperstore.com, Imaging Resources, Ink Technologies Printer Supplies, Myriad Greeyn, Nukote, Nukote Internacional de Mexico, Office World, OfficeWorld.com, OnlineTechStores.com d/b/a SuppliesOutlet.com, Orink Infotech International Co., Printronic Corp. d/b/a Printronic.com, InkSmile.com, Shanghai Orink Infotech, Standard Image USA a.k.a. Imaging Standard, Standard Image Co. a.k.a. Shanghai Orink Co., SupplyBuy.com, Virtual Imaging Products, Zinyaw d/b/a TonerPirate.com, Zhuhai National Resources & Jingjie Imaging Products Co. d/b/a Huebon Co. d/b/a Ink-Tank, and Zhuhai Rich Imaging Technology Co. | U.S. District Court for the Southern District of New York | Infringement of U.S. patents 5,903,803 ('803) and 6,128,454 ('454) | Jan. 2012 | April 2015 | Canon Inc. along with its Canon U.S.A. and Canon Virginia subsidiaries (collectively Canon) filed complaints in the U.S. District Court for the Southern District of New York against 34 third-party supplies vendors. The two patents in the matter covered the design of twisted prism gears used in a large number of Canon and HP toner cartridges. The case was stayed until the U.S. ITC conducted a 337 investigation and issued orders restricting the importation of cartridges that infringed the '803 and '454 patents (see entry below). Ultimately, most of the defendants named in the district court complaints settled with Canon and agreed to consent judgments and permanent injunctions in district court. A few firms did not settle the matter with Canon, however, and the court sided with the OEM and issued default judgments and injunctive relief. |

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Lawsuits Filed by Canon Alleging Infringement of Twisted Prism Gear Patents (continued)

| Defendant | Venue | Patents | Date filed | Most recent action | Status |
|--|--|---|------------------|--------------------|--|
| <p>Acecom d/b/a InkSell.com, Atman d/b/a pcRUSH.com, CAU Acquisition Company, Clover Holdings, Clover Technologies Group, Clover Vietnam, Dataproducts Imaging Solutions S.A., Dataproducts USA, Deal Express d/b/a Discount Office Items, Dexxon Digital Storage, Discount Office Items, Do It Wiser d/b/a Image Toner, E-Max Group d/b/a Databazaar.com, Green Project, GreenLine Paper Co., IJSS d/b/a TonerZone.com and InkJetSuperstore.com, Imaging Resources, Ink Technologies Printer Supplies, Myriad Greeyn, Nukote, Nukote Internacional de Mexico, Office World, OfficeWorld.com, OnlineTechStores.com d/b/a SuppliesOutlet.com, Orink Infotech International Co., Printronic Corp. d/b/a Printronic.com, InkSmile.com, Shanghai Orink Infotech, Standard Image USA a.k.a. Imaging Standard, Standard Image Co. a.k.a. Shanghai Orink Co., SupplyBuy.com, Virtual Imaging Products, Zinyaw d/b/a TonerPirate.com, Zhuhai National Resources & Jingjie Imaging Products Co. d/b/a Huebon Co. d/b/a Ink-Tank, and Zhuhai Rich Imaging Technology Co.</p> | <p>U.S. International Trade Commission (ITC), investigation 337-TA-829</p> | <p>Infringement of U.S. patents 5,903,803 ('803) and 6,128,454 ('454)</p> | <p>Jan. 2012</p> | <p>June 2013</p> | <p>At the same time that it filed suit in federal court (see above), Canon filed a complaint with the ITC alleging some 34 companies were marketing infringing toner cartridges in the United States for use in Canon and HP machines. The cartridges in question were produced overseas. The OEM requested that the commission investigate violations of Section 337 of the Tariff Act of 1930 related to these sales. The ITC agreed to Canon's request. At the conclusion of the investigation, the commission found in Canon's favor and issued a general exclusion order (GEO) restricting the importation of infringing cartridges. A number of shipments into the United States were seized as a result. The ITC's orders were in effect until March 26, 2016, which is when the patents expired.</p> |
| <p>AlphaChem, Baiksan OPC, CEMS, NeoPhotocon, and Park and OPC</p> | <p>Korean Trade Commission (KTC)</p> | <p>Infringement of Korean patent number 258,609</p> | <p>May 2010</p> | <p>June 2014</p> | <p>In May 2010, Canon filed a complaint with the Korean Trade Commission (KTC) against the five defendants, which were Korean manufacturers of OPC drums used in third-party cartridges. With the exception of Park and OPC, the defendants responded with their own suit in the Patent Court of Korea seeking to invalidate the patent. In September 2011, the KTC ruled that the patent was invalid. Canon then made several appeals and the case went to the Korean Supreme Court, which ultimately upheld the validity of the patent and found that the defendants had infringed it.</p> |

Appendix 2g

Lawsuits Filed by Canon Alleging Infringement of Dongle Gear Patents

| Defendant | Venue | Patents | Date filed | Most recent action | Status |
|--|---|---|------------|--------------------|--|
| Acecom, Inc., ACM Technologies, American Internet Holdings, Aster Graphics companies, Do It Wiser, Grand Image, Green Project, Ink Technology Printer Supplies, Innorex Precision, International Laser Group, Jiangxi Yibo E-Tech Company, Katun Corp., Linkyo Corp., LD Products, Nano Pacific Corp., Nectron International, Ninestar companies, Onlinetechstores.com, Print-Rite companies, Printronic Corp., Provantage, Union Technology International, Seine companies, Shenzhen ASTA Official Consumable, The Supplies Guys, Wazana Brothers International, and Zinyaw | U.S. District Court for the Southern District of New York | Infringement of U.S. patents 8,135,304 ('304), 8,280,278 ('278), 8,369,744 ('744), 8,433,219 ('219), 8,565,640 ('640), 8,630,564 ('564), 8,437,669 ('669), 8,494,411 ('411), 8,676,085 ('085), 8,676,090 ('090), 8,682,215 ('215), and 8,688,008 ('008) | Feb. 2014 | Feb. 2016 | Initially, Canon filed 11 separate suits in the U.S. District Court for the Southern District of New York accusing 18 companies of violating nine patents found in certain Canon and HP toner cartridges. The OEM then added three more patents to the suit and later filed an additional 10 patent-infringement complaints against 19 more firms. Later, Canon dropped certain patents from the complaints. All of the patents centered on the so-called "dongle gear" used to rotate internal parts inside Canon and HP toner cartridges. Eventually, all of the defendants either defaulted or settled with Canon. The first settlement came just months after Canon filed its suits and ultimately all of the defendants settled or defaulted in the case. |
| Aster Technology Holland | District Court of The Hague (the Netherlands) | Infringement of European patent 2 087 407 | April 2014 | Dec. 2015 | The Aster suit was one of the first filed by Canon in Europe involving the infringement of a European patent on gears used in Canon and HP toner cartridges. Aster settled with the company in various courts worldwide (see below). |
| Acecom, Inc., American Internet Holdings, Aster Graphics companies, Do it Wiser, Grand Image Inc., Green Project, Ink Technologies Printer Supplies, Innorex Precision, International Laser Group, Jiangxi Yibo E-Tech Company, LD Products, Linkyo Corp., Katun Corp., Nano Pacific Corp., Nectron Corp., Ninestar companies, Onlinetechstores.com, Print-Rite companies, Printronic Corp., Seine companies, Shenzhen ASTA Official Consumable Corp., Suppliesoutlet.com, SuppliesWholesalers.com, The Supplies Guys, Union Technology International, and Zinyaw | U.S. International Trade Commission (ITC), investigation 337-TA-918 | Infringement of U.S. patents 8,135,304 ('304), 8,280,278 ('278), 8,369,744 ('744), 8,565,640 ('640), 8,630,564 ('564), 8,676,085 ('085), 8,676,090 ('090), 8,682,215 ('215), and 8,688,008 ('008) | May 2014 | August 2015 | After conducting an extensive investigation of the U.S. market (ITC investigation 337-TA-918) requested by Canon, the U.S. ITC issued a general exclusion order (GEO) barring entry into the United States of certain toner cartridges with dongle gears and components that infringe certain Canon-owned patents. Numerous respondents defaulted in the investigation or were deemed "non-participating" respondents. Noting the patents in the order will not expire until after 2027, the commission notified U.S. Customs and Border Protection (CBP) that a GEO had been issued in the Canon investigation prohibiting imports of products covered by the patents. |

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Lawsuits Filed by Canon Alleging Infringement of Dongle Gear Patents (continued)

| Defendant | Venue | Patents | Date filed | Most recent action | Status |
|---|---|---|------------|--------------------|--|
| Seine (Holland) | District Court of The Hague (the Netherlands) | Infringement of European patent 2 087 407 | May 2014 | March 2015 | Canon sued the Seine/Ninestar group of companies' overseas European sales firm, claiming it marketed toner compatible with Canon and HP cartridges that infringe European patent number 2 087 407. Canon and Ninestar settled as part of a broader settlement involving cases in other courts. |
| KMP PrintTechnik AG, wta Carsten Weser GmbH | District Court of Düsseldorf (Germany) | Infringement of European patent 2 087 407 | May 2014 | Pending | Suit involving dongle gear patent filed in 2014. German press reports indicate KMP and wta appealed to the Supreme Court after Düsseldorf court found in favor of Canon. |
| Badger Office Supplies Limited, Inkjet Direct Limited, and Greentrees International Limited | High Court of Justice of England and Wales | Infringement of European patent 2 087 407 | Aug. 2014 | Feb. 2016 | The defendants agreed to resolve their pending Canon suit. Badger Office Supplies said the defendants agreed not to market "certain products" which Canon accused of infringement. |
| X-com shop | Moscow City Economic Court | Infringement of Russian patent 2467370 | Aug. 2014 | Feb. 2015 | Canon alleged that the distributor sold infringing cartridges under the Cactus and G&G brands on its website, www.xcom-shop.ru. This was Canon's first suit in Russia involving the dongle gear. |
| Aster Graphics, and Zephyr SAS | Paris First Instance Court (France) | Infringement of European patent 2 087 407 | May 2014 | Unknown | Canon's suit before the Paris First Instance Court against Aster and Zephyr SAS was the first Canon case we know of in France. Aster was named in various cases worldwide and settled all with Canon (see below). The ultimate resolution of the Zephyr case is not known, but we assume the firm settled. |
| Thomas Zenkel (operator of titenalarm.de) | District Court of Düsseldorf (Germany) | Infringement of European patent 2 087 407 | July 2014 | August 2015 | Court ruled the defendant must stop marketing infringing Canon compatible toner cartridges and awarded Canon an undisclosed amount for damages. |

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Lawsuits Filed by Canon Alleging Infringement of Dongle Gear Patents (continued)

| Defendant | Venue | Patents | Date filed | Most recent action | Status |
|--|--|---|------------|--------------------|--|
| European Cartridge Warehouse Limited and Printer Supplies Technology Limited | High Court of Justice of England and Wales | Infringement of European patent 2 087 407 | July 2014 | Feb. 2015 | Court enjoined defendants from selling the toner cartridges and ordered that all infringing inventory must be delivered to the court or destroyed. |
| Aster Graphics | U.S. District Court for the Southern District of New York and International Trade Commission, District Court of The Hague (the Netherlands), and Paris First Instance Court (France) | Infringement of various U.S. and European patents | Jan. 2014 | Dec. 2015 | Aster Graphics reached settlements with Canon in courts in three different countries as well as with the U.S. International Trade Commission regarding the alleged infringement of certain Canon patents. Details of the settlements were not disclosed. We believe, however, that the firm agreed to stop marketing infringing Canon compatible toner cartridges. |
| Two unnamed Brazilian companies | Rio de Janeiro District Court (Brazil) | Infringement of Brazilian patents PI 0720506-6 and PI 0807733-9 | Unknown | May 2016 | Few details emerged from Brazil regarding Canon's pursuit of companies infringing the OEM's patents in that country. Canon did report, however, that the court granted preliminary <i>ex parte</i> injunctions ordering the defendants to abstain from marketing toner cartridges involved in the court actions. Canon said it was seeking both injunctive relief and damages. |
| J&H Greentech & Trading Ltd. | Court of Rome (Italy) | Infringement of European patent 2 087 407 | Aug. 2016 | June 2017 | Canon reported it settled after J&H Greentech & Trading agreed that its Prestige Cartridge business would not market infringing cartridges for Canon and HP laser beam printers worldwide. |
| Jakubowski und Gert GbR | N/A | Infringement of European patent 2 087 407 | Sept. 2017 | N/A | Without filing in German court, Canon said that Amazon vendor Jakubowski und Gert GbR signed a cease-and-desist declaration agreeing to refrain from marketing infringing laser toner cartridges. The vendor also agreed to pay damages to Canon and destroy any remaining infringing cartridges in its possession. |

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Lawsuits Filed by Canon Alleging Infringement of Dongle Gear Patents (continued)

| Defendant | Venue | Patents | Date filed | Most recent action | Status |
|--|--|---|------------|--------------------|--|
| Consumable Direct Ltd. | District Court of Düsseldorf (Germany) | Infringement of European patent 2 087 407 | H1 2017 | Jan. 2017 | District Court of Düsseldorf grants Canon an <i>ex parte</i> preliminary injunction against the defendant. |
| M & S Vertrieb Service OHG | District Court of Düsseldorf (Germany) | Infringement of European patent 2 087 407 | H1 2017 | June 2017 | Preliminary injunction granted by the District Court of Düsseldorf but not yet final. |
| Coemedia GmbH, Moreinks Limited, and Printperfect Ltd. | District Court of Düsseldorf (Germany) | Infringement of European patent 2 087 407 | Aug. 2017 | N/A | The court granted preliminary injunctions against Moreinks Limited and Printperfect, enjoining them from selling infringing cartridges on Amazon.de. |

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