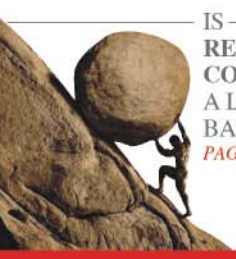

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COUNTERFEITING: IS IT A THREAT FOR COLOR?
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STMC
STANDARDIZED TEST METHODS COMMITTEE

DeLace

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CONTROLLING COLOR, COMPONENTS & CARTRIDGE TECHNICIANS

—STMC trainer Coenie Greyling on remanufacturing a better color cartridge

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2021 SEPTEMBER 16-18
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+86-756-3959284 Cecile.Zheng@RTMworld.com

KILIDER
凯利德

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NPG67/76/GPR53/58/CEXV49/54(Drum)

Compatible With: IRC3330/3320/3325/3320L/3520/3525/3530/3020/3120L/3125/DXC3730/3725/3720/3120L/3125/3025

NPG-68/GPR-54/C-EXV50(Drum)

Compatible With: IR1435/1425I/1435P/1435IF

NPG71/45/46/GPR55/30/31/CEXV51/28/29(Drum)

Compatible With: IRC5535/5535i/5540/5550/5560/DXC5760/5750/5740/5735/IRC5030/5035/5045/5051/5235/5240/5250/5255

NPG73/84/GPR-57/C-EXV53/59(Drum)

Compatible With: IR-4525/4535/4545/4551/4751/4745/4735/4725

KLD-TK8365/8367
KLD-TK8375/8377

KLD-TN-328/626
CN Invention Patent No.: 201911341906.9

KLD-W1108A-W1103A-W1143A
CN Invention Patent No.: 201910813795.0
US Invention Patent No.: US16575369

KLD-IMC3500/MPC3503
CN Invention Patent No.: 201911189749.4

KLD-SP C352/C360/361
CN Invention Patent No.: 201910204654.9

KLD-NPG-73/GPR-57/C-EXV53
KLD-NPG-71/GPR-55/C-EXV51
CN Invention Patent No.: 201910411881O.1
US Invention Patent No.: US16/442587
EU Invention Patent No.: EP19180456.6

KLD-TK1200/1150/1160/1170
CN Invention Patent No.: 201811374841.3

KLD-OKI 310
CN Invention Patent No.: 201910895742.8
US Invention Patent No.: US16595517

KLD-TNP79/80/81
CN Invention Patent No.: 202010518746.7

KLD-MX310
CN Invention Patent No.: 201910495312.7
US Invention Patent No.: US16451011
EU Invention Patent No.: EP19182322.8

KLD-IM350/430
CN Invention Patent No.: 201910875611.3

KLD-R707,KLD-CF257A Tambor
CN Invention Patent No.: 201910519641.0

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IMAGING WORLD

No. 119 | 2021

STMC trainer Coenie Greyling on remanufacturing a better color cartridge

Tanzhou Town Mayor, Guojian Zhao (pictured center), congratulated the innovative RT VIP Expo which saw every guest room on three floors of a hotel transformed into independent exhibits. More than a thousand participated in the one-day + factory tour event in Zhongshan which has become a base for many printing consumables factories—just across the river from Zhuhai.

FEATURES

Wendy Duan

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David Gibbons

I can remember the first time I saw color TV. Yes, I grew up in a world with black and white television that would take up to a minute for the picture to emerge after you switched it on.

On October 7, 1974, Australians saw the first color test patterns being broadcast on their televisions. Five months later, color television was launched. My favorite show was *The Saint* starring a very youthful Roger Moore (pictured).

The first color TV I saw through a shop window display revealed a very colorful action sequence for the actor who would become a famous James Bond star.

Growing up, my father and I indulged in processing black and white photographs in a very sophisticated darkroom with an enlarger and all the chemicals required to birth a monochrome image onto white paper.

To a certain extent, it was a black and white world in which I lived. And yet I had a very colorful childhood.

Could you imagine world with no color? I am not sure about you, but when I select food in a restaurant color plays a very important part in the choice I make. How many choices do we make because color is involved?

Yet the scientists among us would hasten to tell us there is no color in the world!

Truly, color is the result of light bouncing off an object or being absorbed into it. So, if you see the color green, you are actually seeing an object that absorbs every color while green is reflected. My perception of red, then may be very different to yours.

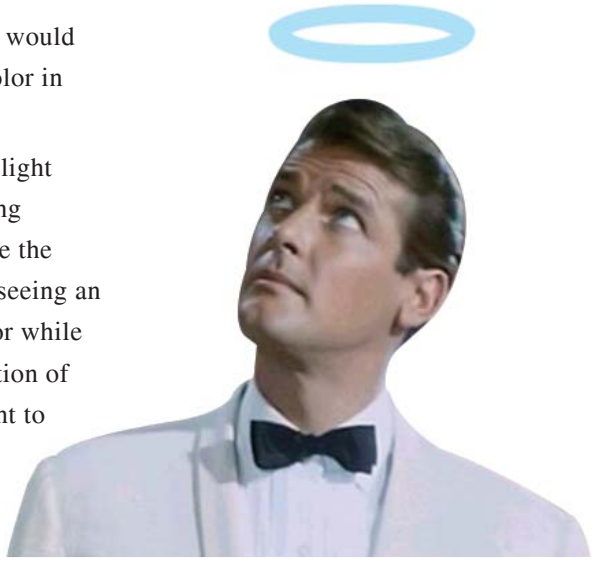
Did you know that black occurs when every color is absorbed, while white is when no color is absorbed?

Does this mean that color is just illusion?

Well, this issue of the magazine is certainly no illusion. We have incredibly talented contributors again sharing important information about the manufacture of color toner, remanufacturing with color toners, and identifying the critical differences faced by those who manufacture color and monochrome cartridges. There is a difference, just as there is between copier and printer color toners as well.

Color your business and your world. Enjoy!

Publisher and Director,
Comexposium Recycling Time Exhibition Services



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Color in the Co
—How it is Di

For the purposes of this article, color copiers are devices used in the medium-to-high volume sector with a focus on the function of speed in copying for A3, A4 and similar formats.

The cartridges for these copiers have separate drum units in most cases. There are always exceptions such as Brother printers, but we will not consider those as copiers.

The HaoYinBao Group (HYB) has a good story to tell when it comes to providing a good user experience with toner for color copiers.

Kim Lee, who is International Sales Director of China-based HYB, expresses opinions about color copier toner based on his 12-years' experience communicating with key global importers and distributors which specialize in copier imaging supplies.

Color Copiers are Configured Differently

If you are going to focus on quality you must view products differently. The majority of HYB's toner cartridges, for example, are manufactured to work compatibly in color copiers from original equipment makers including Ricoh, Canon, Kyocera, Konica Minolta and Xerox. The production lines, together with QC, testing laboratories, development processes and standards were designed particularly for toner where single cartridges have an expected capacity of between 7,000 and 69,000 copies.

From the outset, color toner formulations used to fill copier cartridges must fulfil higher standards for several different reasons:

pier Sector ifferent to Laser?

Kim Lee

1. the toner formulations must provide stability when placed in dedicated machines (a 25,000 capacity compatible toner cartridge, for example, will be continuously used in the same copier machine with four-to-five cartridges without experiencing any drop in performance);

2. even similar-looking cartridges must be filled with different toner formulations to ensure good fusing in different speed copiers;

3. the toners must be machines and spare part friendly—the toner should not harm OEM parts such as the drum and developer units;

Dealing with Faults

Qualified manufacturers of aftermarket color toner cartridges should aim to supply products that are trouble-free to end-user customers. Take for example an end-user who installs a cartridge with toner and an incorporated drum (such as HP CE250A) and it fails in the printer. The end-user calls for the retailer and gets a new cartridge to replace the faulty one in the printer. The whole unit is replaced and in most cases, there are no issues created with other parts in the printer.

This will not be the same story with a faulty color toner cartridge used in a copier. If it is filled with problematic toner, it may cause havoc with the drum units, developer units and other machine parts. A technician will be needed on site to solve all kinds of issues that have resulted until the customer is satisfied. Imagine the costs involved including the downtime experienced by the end-user. Will the distributor who bought the aftermarket products risk their reputation and financial losses with unqualified suppliers?

Qualifications and Experience Make a Difference

Some manufacturers of copier toners are not good with such products. Distributors often share regretful experiences over purchasing poor quality color copier toners claiming quality problems occurred after one thousand or two thousand pages. This is a common experience that upsets distributors where only "entry-level" testing is conducted by the manufacturers.

Those who make color cartridges for laser printers wouldn't stress test toners over hundreds of thousands of pages to test the quality. It's not necessary, but with copiers it is.

Professional factories for color copier toner must test hundreds of thousands of copies in order to make observations on a toner's impact on other printer parts as well as the output on the page.

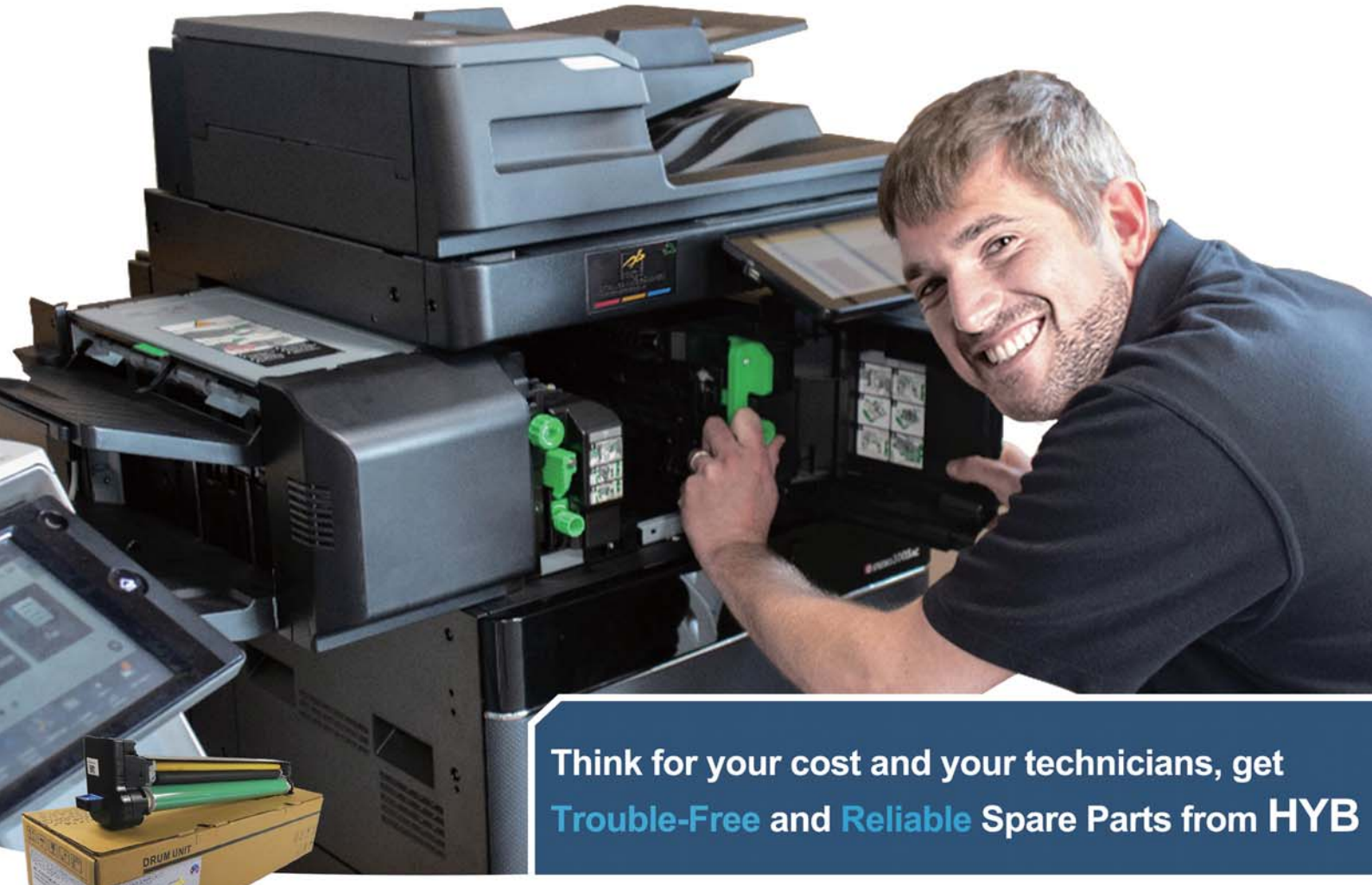
Only by the long-range testing of products can there be a true measure of the return on the investment in developing and producing color copier cartridges. Printer cartridges makers do not make the same level of investment to realise their average profit and pricing levels.

Color toner cartridges for printers carry a much smaller workload compared with copier toner cartridges, generally. Most laser color toner cartridges are produced to meet the demand of unit capacity from between 1,200 and 4,000 pages. Products lists for copier cartridge makers reveal more than 85 percent of products carried have a capacity of between 11,000 and 69,000 copies. In order to supply products that produce good color imaging, any qualified supplier should be equipped with testing copiers for each product and follow specific testing procedures.

Recently, many printer cartridge suppliers have been jumping into the copier imaging supplies segment thinking they can simply

HYB
TONER

SPARE PARTS & COMPONENTS



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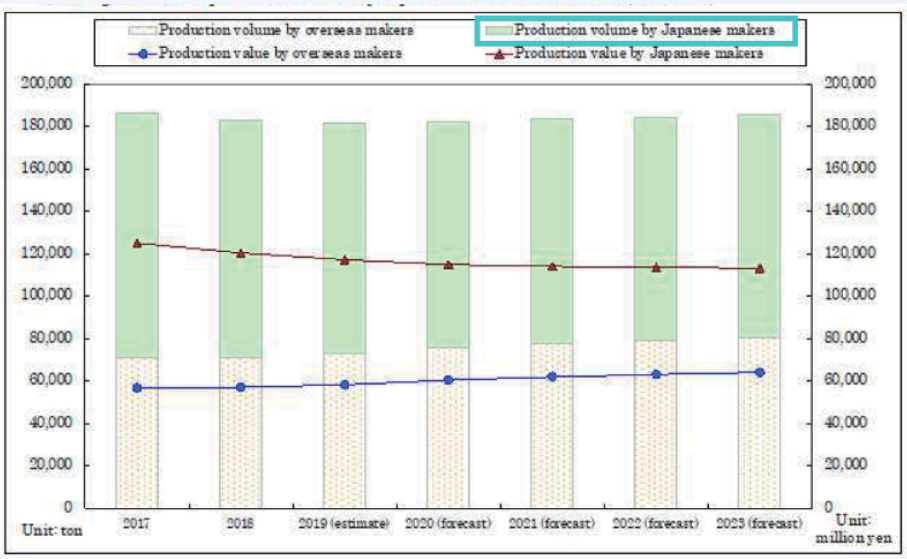
One-Stop Solution: Toner and Parts

www.hyb-toner.com



duplicate their printer manufacturing procedures across to copier toner supplies. These newcomers also bring the same cut-throat pricing strategy they use with their compatible HP cartridges sales. Many are not even aware Chinese suppliers do not dominate the international copier supplies market. Many have developed a bad reputation for poor quality among dealers too. It's important for manufacturers to realize that every market segment has its different group of customers and differing demand for quality. Competition with a premise to respect for these rules will grow good reputation for manufacturers in the field while copying the same business model from the laser printer sector will most probably ruin the market and drive customers back to OEM products.

Professional factories for color copier toner must test hundreds of thousands of copies in order to make observations on a toner's impact on other printer parts as well as the output on the page.

Market Status for Bulk Toners is Different

According to published data from Data Supply Inc. (2020 toner proposal), the 16 Japanese major OEM and aftermarket toner manufacturers still capture the biggest slice of global market share (in terms of both value and volume) compared with the sum of all other international toner manufacturers.

This reveals how the market is dominated by companies such as [1] Canon [2] Ricoh [3] Fuji Xerox [4] Konica Minolta [5] Kyocera Document Solutions [6] Sharp [7] Toshiba TEC and all the way down the list to [16] OKI Data. These are manufacturers for copier machines as well. Besides them, the other ten Japanese companies have eight which focus on copier toner and only two have concentrated their business on laser printers.

It's not difficult to find that Chinese color bulk toner manufacturers such as Dinglong have advancing breakthroughs in printers rather than copiers. The quality of cartridges for copiers depends mainly on the toner while the quality of cartridges for printers depends on the configuration of the components including toner, OPC, MR, chips and other relevant parts. It should be noted that 100 percent of the required components can be supplied by the Chinese supply chain). The different focus on products will eventually lead to a difference in quality like we have noticed from the market's feedback.

Dealers and distributors should pay attention to the setting up of high standards for copier color toner cartridges suppliers and note the differences in the products. Only by growing awareness and paying attention to the aftermarket for copier products will a positive direction be developed. ■

IN MY VIEW

How important is color in your business?

Russia

Tatiana Brazhnikova
Head of Import Department
PMC Company

We see the sales of color machines growing here in Russia. The demand for color cartridges will follow. And then you need to remanufacture those cartridges. This means the demand for color toner will grow, especially high performing, quality toners. Our toners are from award-winning Japanese toner manufacturers IMEX and MKI. We expect our sales of color toner to grow given the appraisal from independent experts at a time when more devices are entering the market.

Turkey

Aylin Horozal
Foreign trade chief
IPM Imaging Products Manufacturing

Colors are great tools for us to help consumers reach their expectations when printing from their computers. Make your plans on the computer come true by printing systems. We always work on the highest quality to make sure they are satisfied with achieving the best results. It has been our greatest honor to ensure end-users achieve great prints with amazing colors that give smooth results for years.

Top 10 Color Copiers

The HaoYinBao Group (HYB) has compiled a list of the ten copiers it has found most in demand for aftermarket copier toners around the world. In each case HYB claims it has developed quality toners which successfully meet the demands of end-users, that are highly compatible with the various parts of the copiers and meet all benchmarks in terms of consistency and yield.

Konica Minolta bizhub C250I

25/25 ppm in color and black & white
Paper formats: A6-SRA3, custom formats and banner format of up to 1.2 metres length
10.1-inch tablet-like colour touch panel with multi-touch support and redesigned user interface for intuitive operation and ease of use
Output capacity (standard) Max. 250 sheets
Output capacity (optional) Max. 3,300 sheets
Stapling Max. 50 sheets or 48 sheets + 2 cover sheets (up to 209 g/m²)
Letter fold Max. 3 sheets
Letter fold capacity Max. 30 sheets; unlimited (without tray)
Booklet Max. 20 sheets or 19 sheets + 1 cover sheet (up to 209 g/m²)
Booklet output capacity Max. 100 booklets; unlimited (without tray)
Copy/print volume (monthly) Rec. 16,000 pages; Max.[1] 130,000 pages
Toner lifetime Black up to 28,000 pages
CMY up to 28,000 pages
Imaging unit lifetime Black up to 170,000/1,000,000 pages (drum/developer)
CMY up to 65,000/1,000,000 pages (drum/developer)

Olivetti D-Color MF 360

Product description: A3 desktop full color Copier/Printer/Scanner.
36 Page per Minute Black and White and Color / 40 000 Copies per Month

- 667 MHZ - 1 GB processor
- 250 GB hard disk
- Paper weight up to 271 g/m2
- Paper capacity up to 3,650 sheets
- Scanning speed up to 70 opm
- Advanced security functions

Canon imageRUNNER C1325iF

Designed for busy workgroups that demand productivity in a compact space.
Print speed(BW/Color, letter); up to 26ppm;
Paper capacity (sheets):
550 standard; 2,300 maximum;
Paper size: 8-1/2" x 14" maximum;
Scan speed: Up to 26 ipm (BW/Color, simplex, 300dpi);
Print resolution: Up to 600 x 600dpi.

Kyocera Mita TASKalfa 3552ci

Standard functions: Copy, Print, Scan
Optional functions: Fax, Feeder, Finisher
Print speed: up to 35 pages per minute
Monthly duty cycle: up to 175,000 pages
Print resolution: 600 x 600 dpi; 9600 dpi x 600 dpi; 1200 x 1200 dpi
Paper sizes: 11" x 17", 17" x 11" 1A3 (Tabloid/L edger)
8.5"x11", 8.5" x 14" 1A4 (Letter/Legal)
Paper input trays: Trays 1-2: 500 sheets each
Bypass Tray: 150 sheets
Paper input capacity (std. I max. with options):
1,150 sheets/ 7,150 sheets
Electrical requirements 120V:
60Hz, 12A; 220-240V: 50Hz, 7.2A
Dimensions (W x D x H) I Weight:
23.70" W x26.18" D x 31.10" H / 202.84 Ibs

Ricoh IM C2000

- Prints up to 20 ppm, copy, scan, optional fax
- 1200 x 1200 dpi max print resolution
- Paper capacity up to 2,300 pages

GENERAL
Warm-up time: 21 seconds **First output speed**: B/W, 5.1 seconds
First output speed: full colour, 7.4 seconds
Continuous output speed: 20 ppm
Memory: standard 2 GB **Memory**: maximum 4 GB
HDD: standard 320 GB
HDD: maximum 320 GB
ARDF capacity: 100 sheets
SPDF capacity: 220 sheets
Weight : 91 kg
Dimensions: W x D x H 587 x 685 x 913 mm
Power source: 220 – 240 V, 50 60HZ

UTAX 2506ci

Manufacturer: Utax Model: 2506ciMax Paper Size: A3 Speed: 25ppm B&W / Color
General Function: Copy, print, scan, optional: fax
Print Technology: Laser color and B/W
Original Format: max A3
Copy/print Speed: max 25 A4 pages/min and max 12 A3 pages/min in color and b/w.
Warm Up Time: 18 seconds
Copy Resolution: 600 x 600 dpi
Greyscales: 256
Paper Feed: 2 x 500 sheet universal cassettes (cassette 1: A6R-A4, cassette 2: A6R-SRA3 [320 x 450 mm]), 150 sheet multi-bypass (A6R-SRA3, Banner [305 x 1,219 mm]), SRA3 and banner only for printing
Paper Output: 500 sheet A4
System Memory: 4 GB RAM, 32 GB SSD/optional: 320 GB HDD**
Continous Copying: 1-999 copies
Dimensions: 790 x 602 x 665 mm (H x W x D)
Mains Voltage: 220/240 V, 50/60 Hz
Power Consumption: approx. 1,750 W max, approx. 500 W in operation, approx. 40 W in stand-by mode, approx. 0.9 W in sleep mode, TEC value: 1.141 KWh/week

Konica Minolta BizhubC454

Properties: Copier-Printer-Scan-fax
Speed B/W: 45 Pages Per Minute
Speed colors: 45 Pages Per Minute
Resolution: 1200 x 1200 dpi
Paper capacity: Dual 500 Sheet Paper Drawer
Volume: 150,000 Copies Per Month
Toner impressions B/W: 27,500 Impressions
Toner impressions color: 26,000 Impressions

Konica Minolta Bizhub C368

Standard configuration: Copy, Print, Scan, 2 Trays, Stand
Optional functions: Fax, Finisher Aditional Trays
Print speed: up to 36 pages per minute
Print resolution: up to 1800 x 600 dpi
Paper sizes: 12" x 18"/SRA3
11 x 17", 17"x 11" 1 A3 (Tabloid/Ledger)
8.5"x11", 8.5" x 14"/A4 (LetterLegal)
Paper input trays: Trays 1-2: 500 sheets each
Bypass tray. 100 sheets
Paper input capacity (std.1 max with options):
1,100 sheets / 6650 sheets
Dimensions (WxDxH)/Welght:
24.31"x26 96" x 30 35" / 187.39 lbs.
Electrical requirements: 120V 50/60Hz

DocuCentre-V C2275

Print, copy, scan and optional faxing
Printing Resolution: 1,200 - 2,400 dpi
Hard Disk: 160 GB or larger (Usable space: 128 GB)
Memory: 4 GB
Speed: A4 25 ppm black and white
25 ppm colour
A3 14 ppm black and white
14 ppm colour

FUJI XEROX COLOR COPIER APEOSPORT VI C5571

Printing details

C5571	B/W: 55ppm Colour: 55ppm	B/W: 55ppm Colour: 55ppm

Hard Disk Capacity: 160 GB
Scan Resolution: 600 x 600 dpi
Printing Resolution: 600 x 600 dpi,
1,200 x 2,400 dpi (High Resolution Photo)
Warm-up Time: 24 seconds or less
Memory Capacity: 4 GB
Duplex Automatic Document Feeder Built In
Original Size
Max: A3, 12 x 19" Min: A5
Paper Weight: 52 to 300 gsm
Paper Output Capability
4 Tray Module: 500 sheets x 4-Tray + Bypass Tray 90 sheets
Connectivity Ethernet 1000BASE-T / 100BASE-TX / 10BASE-T, USB 3.0
Printer Drivers:
Windows® 10 (32bit),
Windows® 10 (64bit),
Windows® 8.1 (32bit),
Windows® 8.1 (64bit),
Windows® 8 (32bit),
Windows® 8 (64bit),
Windows® 7 (32bit),
Windows® 7 (64bit),
Windows Vista® (32bit),
Windows Vista® (64bit),
Windows Server® 2012 R2 (64bit),
Windows Server® 2012 (64bit),
Windows Server® 2008 R2 (64bit),
Window

Best Color Prin

We have all heard the predictions the office of the future would be paperless, with every image and document stored digitally and never leaving the screen. Decades later, we're still living in a paper world, both in the office and at home.

For a wide variety of reasons, we still depend upon hard copy. Invariably your customers will have to go out and choose a printer, and color has become more popular. The pandemic has pushed many of them to do it sooner, given they found themselves working from home. For many, it may stay that way permanently.

Shopping for a color printer may seem like an easy task. However, once you investigate all the available features, making a choice can become quite daunting.

I surveyed several 'best printer' writers: Stewart Wolpin from *cnet.com*, Tony Hoffman from *PCmag.com*, Brian Westover from *tomsguide.com* and Dave Johnson from *Forbes Personal Shopper*. There was not a single, color printer they could agree upon in each of the ten categories.

It reflects the truth that choosing the right printer is a very individual, subjective activity. Almost every printer can handle mobile and wireless printing from a phone or personal computer. So, what makes them different? It has everything to do with what you want to print: color photos, labels, or pages. Some are better suited to the small office or home. Others are powerful and fast work horses. Do you have to advise your customers which is the best printer for them?

With the experts unable to agree, I was left to do my own research on color printers. Here is my top 10 list:

Best Color Laser Printer — Brother HL-L3270CDW Color Laser

When compared with inkjet printers, color laser printers are quieter, faster and work better for text documents. The Brother HL-L3270CDW can print 25 pages per minute and supports full duplex printing. The manual feed slot handles a variety of paper types and sizes, including card stock and envelopes. You get Ethernet, USB and Wi-Fi connectivity, and NFC lets you "touch to connect" so you can print from compatible mobile devices without even connecting to the network.

Best Color Laser AIO for Businesses — Lexmark MC2535adwe

This fast, color laser all-in-one printer offers is relatively small and light, yet it is designed to meet the challenge of a high monthly duty cycle for medium-to-high-volume use in small-to midsize offices and workgroups.
End-users will be amazed at the excellent print quality and will value the security features.

ters

David Gibbons

Best Color Document Printer — Canon Color imageClass LBP622Cdw

This color laser printer has no scanning or copying capabilities but prints vivid text and color graphics with high levels of contrast and range, on both white and colored printer paper. It is ideal for those needing to produce reams of market research reports, business proposals or brochures. This laser printer can deliver near-professional quality that's noticeably superior to what you'll get from an inkjet. It's not expensive to run, thanks to its high-capacity toner cartridge. On average, black and white documents cost about three cents a page and color docs cost 3.8 cents a page.

Best Home-Office Workhorse — HP OfficeJet Pro 9015e All-in-One Printer

This compact, color, all-in-one printer is designed for light-to-medium-duty use in small workgroups and small offices. It can print at 22 pages per minute (ppm) and offers borderless printing and comes bundled with enough ink to keep you going for six months. The 9015e comes with a 35-sheet auto-duplexing automatic document feeder (ADF) for copying, scanning, and faxing two-sided multipage originals without user intervention.

Best Value for Families — HP Envy Pro 6452 All-in-One

This high-tech, modern-looking, entry-level multifunction inkjet printer is good for 200 to 300 pages a month which makes it popular for home offices, family rooms, and dorms. By subscribing to HP's Instant Ink service, users can enjoy a much lower operating cost when compared with competitor devices. It has good print quality and comes with an automatic document feeder (ADF). Being priced at just over US$100 may be attractive for this market but predictably, it's slow.

Best for Portable Document Printing — Canon Pixma TR150 Wireless Portable Printer

This portable, light, single-function device is perfect for printing graphics, photos and color documents on the road. When compared with other similar printers, it is smaller, relatively fast with competitive running costs. The battery will cost an additional $100 and takes two to three hours to charge. A unique feature is its ability to create and save up to five form templates and flyers you can access and print out from the printer's control panel.

Continued page 15

Zhongshan Aumes Electronic Technology Co., Ltd

New import

developer and toner

Company profile

Zhongshan Aumes Electronic Technology Co., Ltd is specialized in the R&D, production and sales of the printer and copier consumables, mainly producing toner and toner cartridge of Ricoh, Canon, Sharp, Panasonic, Toshiba, Xerox, HP and other brands. Our company has R&D department, testing department, more than 200 machines for testing from raw materials to finished products. Factory has three automatic toner powder production lines, with an annual output of over 2,000 tons. Also, we are high quality Japanese carrier professional wholesale. Aumes is always ready to establish cooperative relations with you!

Product display (developer)

Sharp

Ricoh

Konica Minolta

Good product and good service

Full range developer!

Website: www.gzaumes.com
Email: info@ gzaumes.com
Tel: + 86 159 9993 2617 Lena Wong
+ 86 188 2626 4285 Max Chou

Address:
Floor 2, Block A, Hongli Industrial park,
No. 171 QianjinForth Road, No. 3 Industrial Estate,
Tanzhou Town, Zhongshan,Guangdong, China
Post Code: 528467

Continued from page 13

Best Photo Printer — Canon Pixma iP8720

If you're looking for the best photo printer, then you'll be choosing between two companies: Canon and Epson. Both have truly cornered the market for photographers looking to create top-quality enlargements.
This printer doesn't scan or copy, however it is faster than the competition with six ink cartridges and prints up to A3 (13 x 19 inch) sized photos. There are no physical controls or LCD screen, so you control it via the printer dialog box on your device. Instead of a traditional paper tray, users simply stack their media of choice into a rear document feeder.

Best Printer with Cheapest Ink — Epson EcoTank ET-3760

Refillable ink tanks are the most interesting development in printer technology of the last decade. The EcoTank ET-3760 is the latest generation in Epson's cartridge-free range. Offering significant cost savings. This printer costs about four cents for a full color page compared with 20 cents for a typical inkjet printer. The ink tanks are now built directly into the front of the printer, making it easier to refill and see how much ink you have left. The ink that comes in the box should last about two years (or 7,500 pages). Features include wireless, voice-activated and direct printing from a smartphone, copying, scanning, automatic two-sided printing.

Best for Cost-Conscious Businesses — Epson EcoTank Pro ET-5850

This all-in-one inkjet printer is designed to churn out 3,000 to 4,000 pages per month for busy small and midsize offices and workgroups. Its high print quality, low running costs, and a strong line up of productivity and convenience features make it a favorite out of the midrange color devices.
In some cases, it comes bundled with two years' free ink. It has auto-duplexing (ADF) and excellent mobile connectivity options.

Best Large Format Printer — Epson Expression Photo HD XP-15000

Wide-format color printers tend to be expensive but are indispensable if you need to print oversized documents or enjoy printing and hanging your photos around the house or office. The Epson Expression Photo HD XP-15000 can print borderless pages up to A3 size (328mm x 483mm or 13 x 19 inches)—at 5760 x 1440 pixels. This device has six individual color cartridges and includes a 50-sheet tray for specialty media like card stock and a 200-sheet tray for automatic two-sided printing.

Remanufacturing High – A Lost Battle?

Cassio Rodrigues

n-end Color Cartridges

Cassio Rodrigues, an engineer working in the aftermarket since 1994, has extensive experience with inkjet and laser printer products, as well as wide-format printers. Having worked as a technical consultant for more than two decades, he joined Katun Brazil as Technical Supervisor for the Brazilian market in 2018.

When it was first suggested I write something about remanufacturing color cartridges, I was thinking about explaining technical questions, issues, or procedures, However, the more I talked to people about the topic, the clearer it became that the issue was not technical.

I started remanufacturing inkjet cartridges in 1994 and later worked with laser cartridges. As time passed, I specialised in high-quality procedures and was called upon to consult, train and give presentations on the remanufacturing process. The focus was on how to prevent failures, how to avoid leakages, how to choose the best combination of materials (such as OPC drums, toners, and chips). Gradually I focussed more on large format printing equipment. Through destiny's hands, I found myself being "recycled" back into the aftermarket to be hired by Katun where I work in the technical area.

In the past two decades, we have seen the share of color compatible cartridges increase significantly every year. This has eroded the market share of reman color products, both in terms of price and quality. So, the question remains: Is it still feasible to remanufacture color cartridges?

To correctly remanufacture complex color cartridges, such as HP, is a tricky procedure. Even HP has attempted to do this in the past and failed.

The process starts with the choice of raw materials and how they are combined within the cartridge. Usually, the better suppliers will offer the toner powder, drums and blades. I strongly recommend everything should be changed during the reman process. Even if your naked eye perceives some components are still useful for one more cycle.

The process itself is also tricky. Every cartridge must be carefully disassembled, thoroughly vacuum cleaned, inspected and cleaned. All components that will remain with the cartridge, including seals, rollers and agitators must be checked.

It would seem that color remanufacturing is viewed as being a secret or the practice of some obscure sect.

And then, and only then, you refill the toner, segregating the filling of each color to an isolated place on the production line to avoid contamination in the air. After this, I strongly recommended every single cartridge is tested to make sure it is performing correctly.

These simple but important principles and procedures were the formula for every consultancy or presentation I did. Nothing has changed and, no matter the model of the cartridge or printer brand, the process must be adhered to.

I have found these procedures nowadays are very restricted to just a few companies. It would seem that color remanufacturing is viewed as being a secret or the practice of some obscure sect. It is totally unnecessary as it is as simple as following the steps and not cutting any corners.

The Cost

Apart from the cost of the raw materials and components, there is also the cost of the procedure itself. It should be noted that it takes two or three times longer to remanufacture a color cartridge compared to a monochrome one. And it demands a qualified person to do it. It requires staff who are experienced and capable of identifying any possible defect among the used parts and to follow the correct steps.

When you consider the labor, the cost to produce a color cartridge is at least twice that of a monochrome one. Some companies just don't want to absorb this cost.

Working at Katun, close to our lab, I have had the opportunity to fully understand the engineering that goes into a cartridge. It is difficult to describe the care that has to go into every detail during the research and development phase. The process to source, qualify and maintain every single supplier is exhausting because everything from a tiny spring to the toner powder, chip or drum must be complementary with every other part. Then there are the endless tests and qualifying protocols that must be conducted to be able to certify a product that can work as well as the original one. This also takes time and effort and some refuse to invest in it.

Certified **Quality**

Benefits of Certification

Seal of Approval for Cartridges

STMC certification proves that the company certified uses the highest industry-approved standards in manufacturing its cartridges. The STMC logo means that the cartridge in the box has been remanufactured by a company that cares about quality.

STMC stands for the Standardized Test Methods Committee. This global committee formed to find and promote standardized test methods for the printer cartridge industry.

For twenty years, the International Imaging Technology Council has evaluated and monitored the STMC program, fighting for those who use it proudly and against those who misuse it.

Customers demand STMC. Join the hundreds of STMC-certified companies that these customers want to buy from. Get certified today. Contact katie@i-itc.org for more information.

Another cost, related to color cartridges, is the failure rate. With profit margins shrinking year by year, many remanufacturers have had to cut some internal costs. I have found production lines in more than a few companies where the same employees are remanufacturing monochrome and color cartridges in exactly the same location.

The consequences of cost-cutting mean there is less time to remanufacture which in turn means the number of steps is reduced. You can get away with this sometimes with monochrome but you are going to have huge problems if you do the same with color cartridges. My research reveals remanufactures will experience up to 25 percent failure rates in such conditions.

When you consider these costs and failure rates, I can see why many companies are leaving color remanufacturing to focus on new-build compatibles instead. Unfortunately, as we all know, there are "compatibles" and then there are "compatibles." If a brand wants a high-quality cartridge, they must be prepared to pay for it or they will be subject to products of dubious quality.

How about the consumer market?

Are there customers willing to pay high sums for high-quality cartridges? Are there any customers looking to pay less for cheaper products?

The answer to both questions is "yes."

As high-quality aftermarket products normally cost more than low-quality products, there are always going to some who will pay for a cheaper product with the false impression of saving some money. There are just as many who are more than willing to pay more for a high-quality product that will deliver "close to OEM" quality. Of course, "quality" depends on several factors including failure rate, color matching, yield and machine degradation.

The consequences of cost-cutting mean there is less time to remanufacture which in turn means the number of steps is reduced.

The more effort that goes into the process and the materials to remanufacture a cartridge will have a direct impact upon the street price for that item. There will always be customers pursuing low cost as there will be for high quality.

The big risk for all is the exchange rate of the US dollar. Every product, including OEM, compatible new-builds, supplies and components are impacted by the US dollar. In some case the conversion rate into the local currency may affect the market share between OEM and aftermarket products. Even the market share between new-build compatibles and remanufactured cartridges can be impacted. Higher rates favor remanufactured cartridges because the significant costs are the fixed overhead ones including staff rent, power and other factory and office expenses—not the components.

So, is the war lost for the remanufactured color cartridges? I would not be too hasty to declare it because the quality of available supplies is higher than it has ever been. Excellent techniques and procedures for recycling and remanufacturing have been established over many years.

The key is ensuring remanufacturers keep their technical staff well trained. If they lose these skills and personnel in an attempt to reduce remanufacturing costs, then there is no doubt remanufacturing will lose more battles and ultimately the war. ■

Controlling C
& Cartridge T

Based in Johannesburg, South Africa, Coenie Greyling is an official STMC trainer throughout Africa. He has a proven record of success in production and remanufacturing environments related to safety, materials management, job planning, quality control and employee and customer training.

Color, Components & Technicians

—STMC Trainer Coenie Greyling on remanufacturing a better color cartridge

Coenie Greyling

It is true to say that the remanufacturing of monochrome cartridges is more production-friendly and far more forgiving than with its color counterparts.

In color operations, you have four individual cartridges combining their outputs to create a single image on the printed page, as opposed to monochrome systems.

There is a reason why the aftermarket has such a low market share of color cartridges compared to monochrome. In general, both remanufacturers and new-build manufacturers have not been able to produce a consistent, reliable product. In many cases, they have abandoned their efforts in color to concentrate more on the monochrome.

The issue that needs to be addressed is the lack of the aftermarket offering of an integrated color system that offers matched, balanced components that give consistent print quality throughout the lifecycle of the cartridge. This is a missed opportunity since the market potential is considerable.

Historically, successful companies manufacturing color cartridges had a separate 'color' section in their production units. If you were careful, this was not necessary to avoid cross-contamination. Rather these areas would be highly focussed on the production of color cartridges.

From my experience, a good "mono" technician cannot necessarily reman a color cartridge. Quite to the contrary, it would be better to train a new technician for this post to ensure no "bad" habits were transferred from the previous "mono" experience. It is essential the color technician accept and understand the challenge in the design and the manufacture of all the individual components. They also need to respect the higher tolerances required on assembly and disassembly and associated technicalities. Such technicians would soon be seen as being more specialized and adept with a thorough understanding of the complete system, its reason, use and implementation.

Component handling and process – the basic rules

In years long gone, the handling of the components contained within a cartridge was of utmost importance. Replacement components like magnetic roller sleeves were a dream come true. We had to treasure every available, reusable part

Color Densitometer measuring reflected density

from the OEM cartridge. The handling of the OEM components was a crucial part of the process if viable for reuse. Light exposure to the OPC or touching the working surface of any component was a cause for concern.

Once aftermarket replacement parts became available, multiple tests needed to be conducted to find the best combination using Component Selection Methodology.

Fundamental to the ultimate outcome of the cartridge print quality is the combination of components used in the system. None of the components stand alone and has a profound impact on the next component it interacts with. This principle is paramount to the function of the system and is how the OEM developed it with big dollar investments.

To some extent, it is worth emulating systems similar to OEM production as there is a very specific reason for each component and process. They have spent millions of dollars to create the cartridge. So, it is logical to study and emulate what they have achieved—even down to the assembly. Something as seemingly insignificant as a dot of conductive grease or lubricant in a specific gear can dramatically affect the results and cause variations in print quality and stability.

The OEM does not always get it right either. There are some cases where a design mistake slipped through their R&D in certain product releases.

To highlight some of the requirements, consider the doctor blade. The number of welds on the blade connecting it to the stamping can change the tension/stiffness of the blade, and so does the thickness of the blade – too thick and too stiff results in excessive pressure exerted onto the developer roller, too thin and too little pressure and the triboelectric charge generated behind the blade could be compromised.

This all happens at an engineering level. So, if you were to find a leaking issue from underneath the doctor blade you might attempt to attach some foam to prevent the leak. It's quite possible you would create another issue by changing the angle of attack of the doctor blade to the developer roller. The "band-aid" approach of yesteryear would not suffice in this case.

In addition to the doctor blade concern, we should add the toner, toner adder roller and the developer roller sealing blade. This covers the development section of the cartridge, and all these components interact with each other directly. Each component in this system has to compliment the component before and after it in the printing cycle.

PRINTING CONSUMABLES

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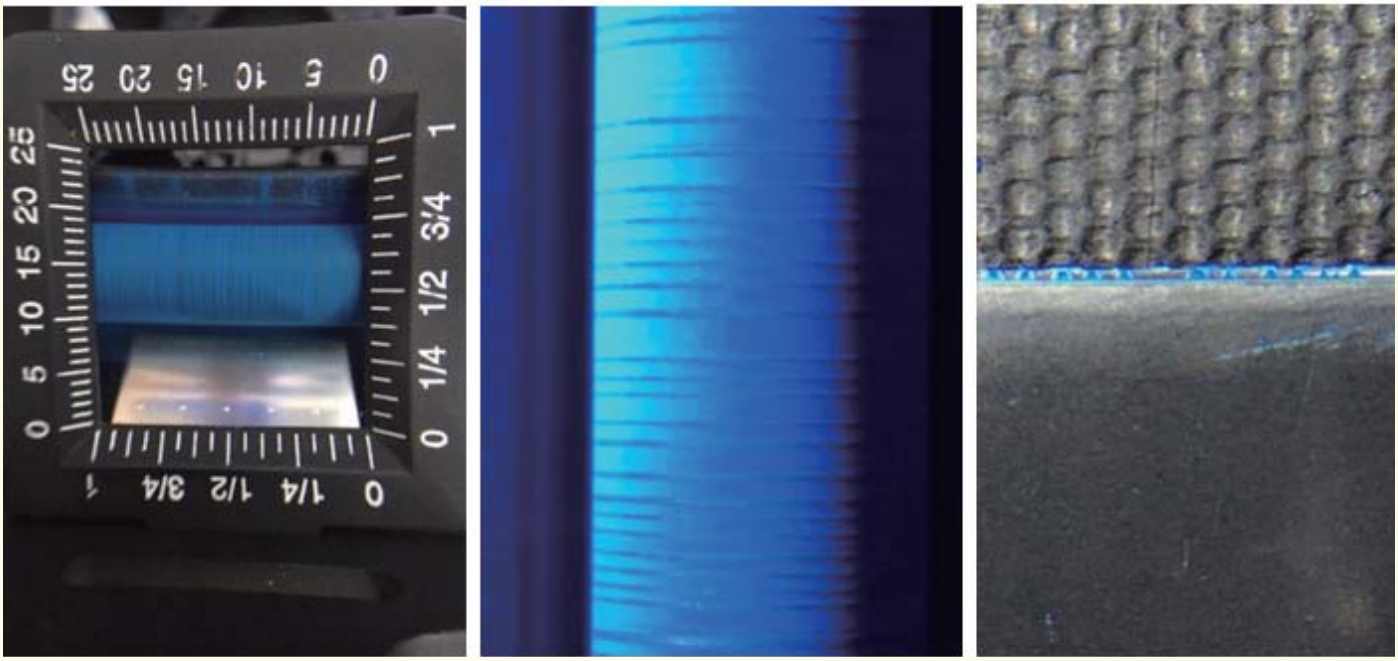


Using an iPhone with a printers loupe to highlight scoring on the developer roller due to toner build-up on the doctor blade. What was the true cause?

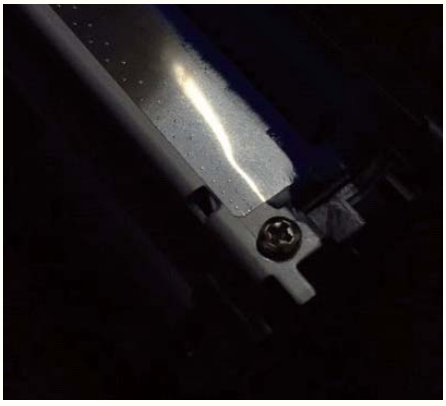
The OEM does not always get it right either. There are some cases where a design mistake slipped through their R&D in certain product releases. For example, the 2025 color cartridge initially had a developer roller sealing blade with insufficient rigidity.

This design shortcoming caused the toner to escape past the contact surface. The developer roller created the right conditions for a defect to appear on the printed page – this was quickly picked up by the OEM and soon rectified. As always with color, if you change one part of the component or assembly equation, you can be sure your whole combination will not work optimally.

Not only are the components critical to success but the finer details of assembly and disassembly should be highlighted.

Take the doctor blade gapping for instance. Going back to the original SX cartridge, it had a rigid doctor blade, and the position/gaping of the blade in relation to the magnetic roller was essential to achieve consistent quality. As such the aftermarket offered remanufacturers specific gapping tools and a host of jigs in the years that followed in order to achieve this.

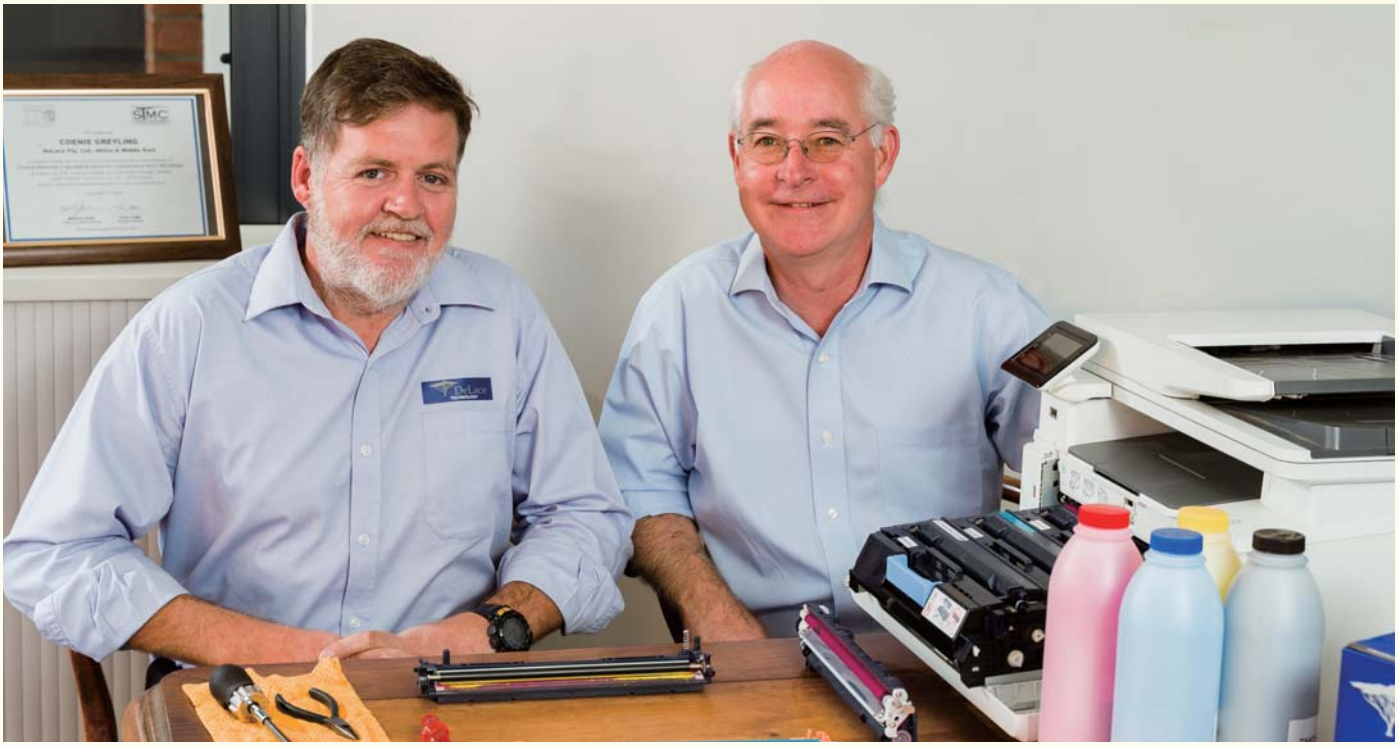
Even overtightening of the fixing screw will cause too much torque on the blade surface, distorting the blade marginally, but enough to generate printing defects.



The Empty Core

The combinations of component supplies developed for the remanufacturing industry have been developed using virgin, single-cycle, empty OEM cartridge cores. The supply of cores offered a level of consistency for the matched components.

New-build cartridges, by comparison, vary too much, given they come from scores of different suppliers. Initially, the new-build plastics they used were not robust or stable enough to permit remanufacturing. Today, however, it can be argued that certain new build factories are producing cartridges using plastics that would allow an additional cycle or more, so remanufacturing is becoming a very real possibility. In fact, the factories producing these quality, color new-builds could release stable, matched parts and kits. Should they do



Coenie Greyling and Stuart Lacey say its time to properly remanufacture NBC cartridges as well as those of the OEM.

so, then their empties would become a new sought after and manufacturable commodity.

Post-production Considerations

Also essential for the end-user experience is to avoid embarrassing 'leakage' as soon as the cartridge is taken out of the box. When cartridges are post-tested at the factory, they should be run 'cartridge dry' to deplete the priming and testing toner. This could also avoid a stuck seal that literally 'explodes' over your customer as they pull the release strip.

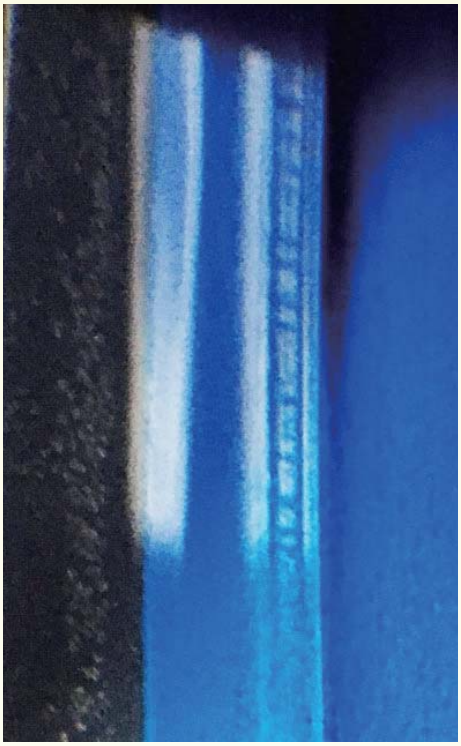
Even those who manage to build the perfect color cartridge with the ideal matched system can have it all ruined during shipping. The sitting position of the cartridge during shipping is critical to limiting the possibility of toner spillage. Even when the cartridge is sealed correctly, the actual position of the cartridge is vital to avoid waste toner from your post-testing to escape from the waste bin.

Even if you have a supplier who offers all the components necessary to build a color cartridge, there is no guarantee of success. The question is always 'have these components been developed and matched to create a balanced system/ combination?

If you have a supplier of components who do not understand the fundamental electrical and physical interaction between the critical components, then it is impossible to have a balanced system.

If you have a supplier of components who do not understand the fundamental electrical and physical interaction between the critical components, then it is impossible to have a balanced system. It is almost impossible for an independent remanufacturer to develop a perfectly matched system. They are totally reliant on the component manufacturer and cannot control the multitude of variables. This would explain, in part, why the aftermarket has such a small share of the market against the OEMs. The aftermarket's share of the monochrome global market is much greater than the color share.

Remanufacturing mono cartridges is much more forgiving. However,



Scoring on the developer roller sealing blade.

competent training along with a perfectly matched and balanced color system would provide an excellent product that could compete confidently and directly with the OEM.

I have had the privilege of working alongside some of this industry's leading engineers. They have developed a suite of components perfectly matched to create color systems. The only variance is the accuracy of the technician who handles the components.

It is perfectly feasible today to build a color cartridge that can compete with the OEM. It simply needs a matched system of components, a core that allows you to use these components, a little care in your facility and a well-trained technician. ■

It's not always easy in Africa... Travel does not always run smoothly. Journeying from my comfort zone in South Africa to the country of Zambia gave me a whole new level of appreciation for the tremendous work of industry engineers and QC personnel.

The task to training the hopeful, the brave and the potential cartridge remanufacturing technicians was not an easy task either. But I succeeded to train each successful candidate—none of whom had ever seen a cartridge before—while standing under a tree "somewhere in Africa."

The spoken word is not sufficient, so hands-on technical demonstrations and participation sessions were required. Technical knowhow is taught with the a series of nods, head shakes, grunts and hand gestures. Habitually, pencil and paper was the first tool to come out the toolbox to assist where a technical drawing allowed comprehension.

▲ Technicians in the making on day 1 of training with basics of mono and color operations

◀ On completion of training, technicians received a well deserved token for their accomplishments.

I retract my opening statement. Now I say, "sometimes things are easy in Africa."

With knowhow and proper preparation, in even some of the strangest environments, good training and engineering will trump the odds. A matched system of components and eager-to-learn personnel are the keys to accomplishing quality, color, reman cartridges—not only in Zambia but in a host of other countries from Angola to Turkey and India. ■

5 QUESTIONS

Mito's Global Queen of Color Shares Market Insights

Can the aftermarket deliver a color toner that is comparable with the OEM?

Yes, it can. The quality of replacement color toners researched and developed by the aftermarket has made significant improvements in the past 20 years to the point that colorfastness and yield are as good as the OEM benchmarks.

How well has aftermarket color been accepted in the global market?

We keep an eye on the trends and I can say our analysis of the data reveals aftermarket color has now captured 30 percent of the US and European markets and between 10 percent and 20 percent in other markets. Globally, aftermarket color toners have 20 percent of the market which is double what it was even five years ago.

End-users have higher expectations when it comes to quality for color toner cartridges. There are very few manufacturers who can meet these standards, so consumers still prefer to choose original color toner cartridges. Color printers cost more than monochrome printers which are the preferred choice for those who are cost conscious.

How different is manufacturing color toner from monochrome toner?

Because there are significant differences, we continue to invest four percent of our sales revenue to develop new products, quality control, patent research and development to make sure we meet the needs of our customers:

- color toner cartridges need higher quality components and meet matching standards. To work perfectly, the four, color toner cartridges—Cyan, Magenta, Yellow and Black—must not only match each other, but also match the original toner cartridges as well. Matching tests for main components are essential for color but not required for monochrome products;
- color toner cartridges have higher requirements when it comes to the precision and wear resistance of the components. In some color printers, for example, when one toner cartridge is printing, the other three toner cartridges are rotating together. This causes resistance and wear even if toner is not being used. We must continually be testing the wear resistance of the main components and control the powder consumption of toner cartridges which do not print but rotate together. This is not a concern for those manufacturing monochrome cartridges;
- end-users have higher quality requirements for color printouts, so the aftermarket must strictly control each stage of the color toner cartridge manufacturing process from raw material to finished product.

How do you balance manufacturing new build compatibles with remanufactured color cartridges?

Mito started its business with remanufactured toner cartridges and it continues to be our preference for those customers who need them.

Mito has a license to import e-waste making it legal for us to source, buy and import empty toner cartridges from anywhere in the world. Together with the rich technical expertise we have acquired over 18 years we have the ideal scenario to remanufacture quality color toner cartridges. Our wider group of sister companies also produce replacement components for remanufactured toner cartridges. Producing high-quality, remanufactured cartridges is not the main problem for us. The decreasing demand from the market for remanufactured toner cartridges is our main concern. Not all of our customers want to buy remanufactured toner cartridges, so we must follow the market and supply what end-users need.

What is Mito's commitment to color in the medium to long term? Will you continue to be the "queen of color" for the global market?

Mito's commitment to its color business in the medium to long term is to manufacture high quality, patent-safe color toner cartridges for its global customers.

In my opinion, the queen of color in the aftermarket will always Mary Ouyang, the founder of Mito. What she established back in 2003 set the standard for high quality of color toner cartridges allowing us remain the No.1 aftermarket supplier of replacement color toner cartridges.

I will continue to follow Mary's lead and focus on color toner cartridges and remanufactured toner cartridges, using innovative procedures such as:

- automated production lines to improve work efficiency and high quality consistency;
- developing new sales and marketing channels to meet the changes in end users' consumption habits;
- increasing our investment to research and develop more of our own patented, design-around products to maintain long-time business relationships. ■

Wendy Duan, General Manager of Mito, <wendy@mito.com.cn>

Dr Stanislav Malinskiy

Russians, Color and New Printing Technologies

Color laser printer supplies share continues to grow as does the demand for compatible laser printing supplies.

Color printing is growing… in Russia. Sales of color printers and MFPs are growing, as well as sales of color printing supplies.

The influence of color on the perception of information is well-known. The use of color considerably raises the impact and effectiveness of documents making it a key reason for the growth in demand for color printing devices.

The increase in the number of inkjet printing devices is largely due to the progress in the development of inkjet technologies. For a long time, the numbers of inkjet printers were restricted by the high cost of printing each page. Prices on inkjet printer cartridges were exorbitant. However, new technologies applied to modern inkjet printing equipment has allowed the cost issue to be more competitive with other technologies, such as laser printing.

We have all seen the arrival of printer models that do not rely on the traditional cartridge system. Rather, cartridges have been replaced by ink tanks that deliver a very competitive cost-per-page result. This has brought disruption to the market. Today, the Brother DCP-T510W/T710W, the Canon MAXIFY GX6040/GX7040, the PIXMA G6040/G7040, the Epson L6550/L6570 and the HP Smart Tank 513/515/516/519 have all captured a significant share of the Russian market. And their share is increasing.

The growth in the number of models by various printer OEM brands implementing the economical, profitable, non-cartridge technology has enlarged the capabilities for the buyers. The growth of popularity of these models can also be attributed to the possibility of using the cheaper, compatible inks for refilling.

Apart from being economical, the new inkjet technologies also come with speed benefits. Models which offer high-speed inkjet color printing are able, for the first time, to compete with color laser printers in large enterprises.

The Epson WorkForce Enterprise and HP PageWide Enterprise are two such models that have captured market share. In the beginning, Russian customers didn't trust these models. However, positive word-of-mouth feedback from experts who use them in their work has helped to promote these models in the Russian market.

At the same time, the Russian market has also seen growth in the sales of laser and MFPs. In 2020, the color laser printer supplies segment constituted 20 percent of the whole Russian laser printing supplies market. And its share continues to grow as does the demand for compatible laser printing supplies.

It is important to note the reason for the growth is the greater knowledge and education level of the buyers. Conferences organized by Information Agency "*Business-Inform*" and the Russian association AQCMS to the larger Russian buyers has raised the opportunities. The modern devices that provide color printing as well as the availability of quality non-OEM supplies, their brands and manufacturers has been of interest to the government, enterprise and small-to-medium buyers.

The international Open Quality Printing Contests conducted by Informational Agency "*Business Inform*" have raised the profile of the technologies and the available supplies within the color office printing segment. The results of these contests are shared with Russian buyers who seek independent opinions about new brand models and purchase modern color office equipment without hesitation.

Overall, the Russian color printing market has a very bright future. The emergence of the new generation of economically profitable printing devices, together with the availability of quality corresponding compatible supplies, along with the improved understanding and knowledge of the buyers will see growth in the next few years. ■

Dr. Stanislav Malinskiy

RT Global Partner For Russia

Dr. Stanislav Malinskiy, the general director of BUSINESS INFORM—an information agency based in Moscow—is mainly active in researching and consulting on the Russian office equipment and supplies market and also has over 250 scientific works and articles to his name. He is chief editor of the Russian catalogs of printers, copiers, MFPs, and supplies.

Colorless: The Da Stopped Printing

Everyone in business is quite good with their mobile devices and laptops. When was the last time you needed to print out a color pie chart?

As the office workers corralled around the conference table, one thing was quickly apparent no one had a stack of paper to hand the attendees; there were no printouts of colored pie charts, graphics or product broachers.

So, how would the sales vice president emphasize how great the sales team did, without the colored graph?

Oh, that's right, the sales VP put up a remarkable story on the 90-inch glass panel hanging on the wall and emailed the attendees the link to the digital media after the meeting.

The aspirations in business color printing never arrived and, unfortunately, will never come to be. The business processes for delivering color content have evolved so far off the printed page that printing this content now hinders productivity.

More and more documents are staying behind glass and printed pages are a significant interruption in business applications.

Over the last decade, the color printer and color MFP have significantly evolved, and this evolution in printing color has even brought the cost of printed output to extremely low levels compared to just a few years ago. However, the printed color page has never aligned in cost with the black and white (monochrome) output. Realistically, it never will.

In today's business environment, why would print

Over the last 25+ years, Ray Stasieczko has called the imaging industry (copy/print) home. He was COO/ Vice President of ImageQuest over the past years. Ray has a deep understanding of the transformation happening in the industry, and his rich experiences allows opportunities for others to navigate through the transformation. <raystasieczko@gmail.com>

y Businesses in Color

Ray Stasieczko

equipment end-users pay for color output when that output cost is nothing when left behind glass?

All reading this agree that the printed page is not the desired outcome of those printing the page; the desired outcome is the consumption of the information on the paper.

In our highly technological advancing world, those needing to consume information realize the ease, mobility, and tremendous benefits of keeping information digital, keeping and consuming information behind glass.

If anyone in the print equipment and services industry looked at the data, they would quickly see that business color output has remained below 20 percent of total output even as monochrome printed pages continue declining.

In business printing applications, end-users are not replacing monochrome output with color output. Instead, end-users are replacing the need to read printed output with the ability to consume information behind glass digitally.

When the color printer and color MFP were born decades ago, today's technologies were unimaginable. Unfortunately, as in most disrupted industries, the actors who participate in the old way are reluctant to comprehend the real threats of the innovative methods, new approaches designed to eliminate the approaches of the old way.

The advancements in managing, consuming, and deleting information behind glass have far exceeded the outdated processes of hard copy paper.

Those in the supply business of color MFPs and color desktop printing were always betting on the billions of business monochrome pages converting to color. Unfortunately, that reality has faded, and instead of monochrome output converting to color output, the trend is for all output is a transition to being behind glass.

The print equipment, supplies, and services industry delivering to business end-users will not see a migration from one device type to another print device type. The migration they are now participating in eliminates the device and allows business end-users to achieve their outcomes while keeping the information in the digital landscape behind glass.

More and more documents are staying behind glass and printed pages are a significant interruption in business applications.

The business's desired outcome is the ability to consume information, not the printed page. So, the question which business leaders will ask more frequently will be, why are we still using processes which cause the need to print this?

There has been an expectation that with COVID-19 forcing more to work and study from home there would be an increase in the use of smaller color devices. However, the extremely low volumes will not warrant profitability to those organizations servicing businesses. The fantasies regarding home office printing have all been proven wrong. Hopefully, the actors servicing business print are past chasing that stillness.

There will have to be significant consolidation in the supplies industry, both OEM supply manufacturers and alternative manufacturers, i.e., cartridge remanufacturers and non-OEM new build manufacturers.

I believe that businesses will never produce more than 20 percent color printed output in business applications. However, please keep in mind that 20 percent will continue to be a declining number (in terms of units) as the 80 percent monochrome output is also in a continuous decline. I also believe that the monochrome business MFP will not be replaced with a color output MFPs in the way many in the industry once hoped.

The printer supply industry focused on the business output must focus on cost improvements and consolidation. Those who fool themselves that business applications will convert from monochrome output to color output are foolishly chasing a declining number.

None of the industry's actors want to face innovative disruptions designed to eliminate their value. Remember, the end-users of all industries are only participating with that industry to reach the desired outcome.

When organizations or industries mistake their product or their services as the desired outcome of those they serve, they will soon understand that they were just a temporary means for their customers to achieve that desired outcome.

“Disruptions destroy those who mistake 'temporary' for 'permanent'.”

"Status Quo is the killer of all that will be invented." ■

Manufacturing Color

—Who is doing it?
—How is the process different to mono

The market for toner and related materials for electrophotography has changed both technologically and geographically. The more than 90 toner manufacturers globally, irrespective of their market position, are in a market of derived demand. Their choices in both technology and economics are driven by application and market when manufacturing toner products.

All-in-one monochrome toner cartridge sales volume is predicted to continue to decline because of the trend towards the use of color print devices. This growth of color toner complicates the market particularly for third parties as technology developments by the OEMs and cost issues to be faced in the market multiply. OEM manufactured supplies continue to dominate the color market, however as a result of several factors—not the least of which is the high cost of cartridges—users are ready to buy aftermarket color cartridges.

The buyers' attitudes on buying color toner supplies are identical to their attitudes on monochrome. The emphasis on their desire for quality, reliability, etc. is paramount. Third-party manufacturers have had difficulty in addressing the issues on providing alternatives to OEM supply, but when the products do arrive at the right standard, users buy good quality aftermarket color laser cartridges.

The Challenges in Designing Colored Toners for Manufacture

By comparison with monochrome toners, the design of colored toners is much more complex.

In simple terms, the mark made on the final hard copy with black monochrome toner is just that - black. True black isn't always the same from a colorimetric perspective and the optical density of black print can and does vary. However, by and large, when an observer looks at a page of black print it is not particularly relevant what the black print is from a color point of view. This is worlds apart from color printing.

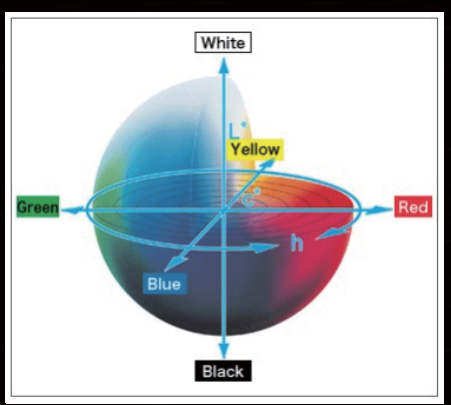
Colored printing is based on the printing of the combination of cyan, magenta, yellow and black (CMYK) dots. "K" is the abbreviation used to denote Black from the Japanese Kuro

Colored printing is based on the printing of the combination of cyan, magenta, yellow and black (CMYK) dots. "K" is the abbreviation used to denote Black from the Japanese Kuro.

The number, size, optical density and dot positioning by a color printer are determined by software to create a rendition of the color of the original image. The human eye is relied upon to integrate the visual of these dots to create in the observer the impression of the intended spectral shade in that image. This effect is by the process called "Subtractive Color".

The printer hardware, firmware, software, and toner work in harmony to enable the accurate rendering of the image. The OEM has, in the development and design of the color printer, matched these four elements to faithfully reproduce any image. For the toner, the chemical formulation and physical specification are key to determine the toner performance enabling the printer to achieve the correct color.

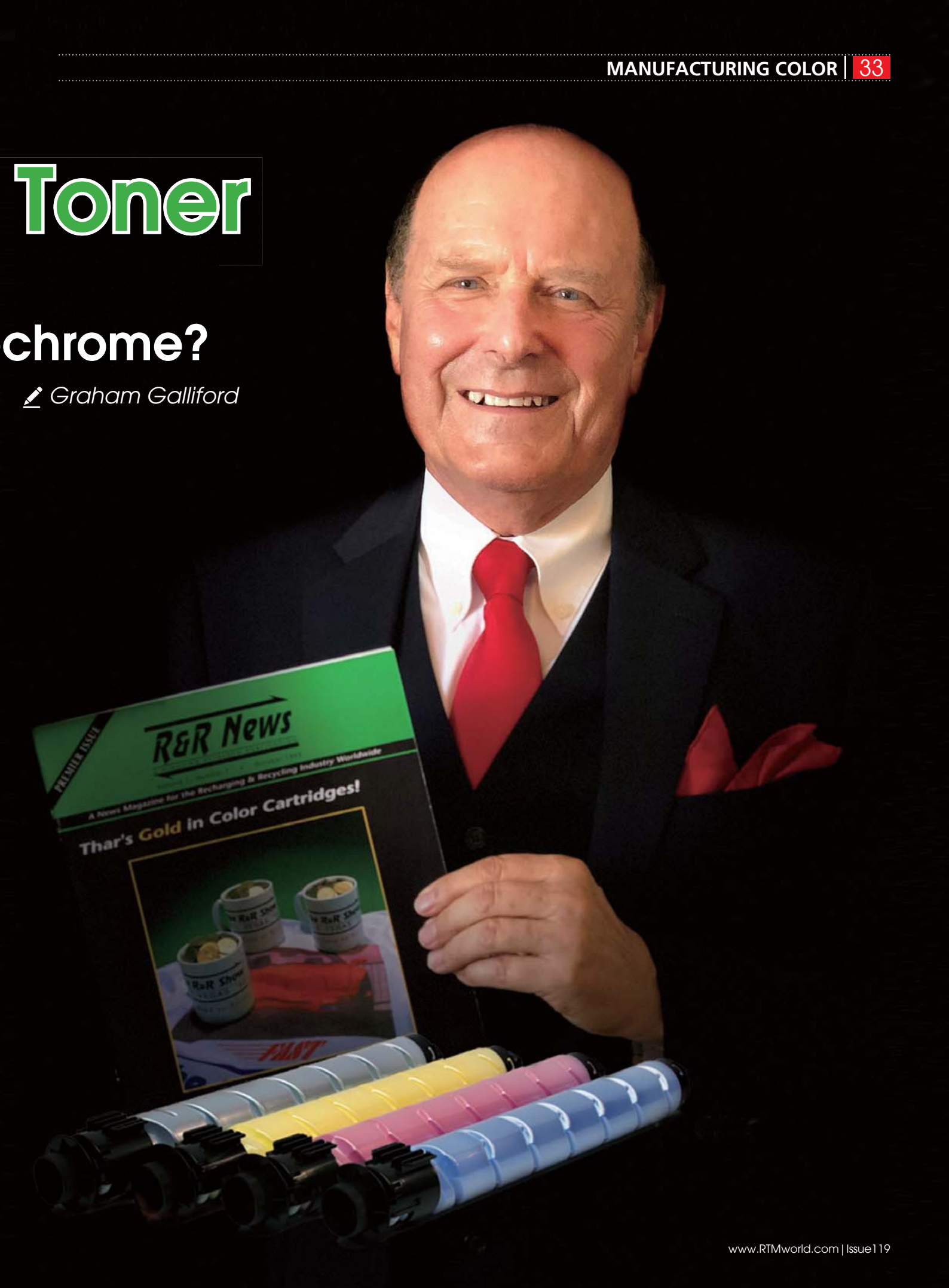
The elements determining the toners' performance include the fusing characteristics, toner film transparency, fused toner gloss, and the toner color value. The latter is typically defined by the L, a*, b* value, which is the measured quantification of any color visualized and quantified by using the 3-dimensional CIELAB color space. The L*a*b* values for each of the toners when printed determines the "color gamut" potentially available for the printer. The 3-dimensional color space is represented in the diagram that follows.

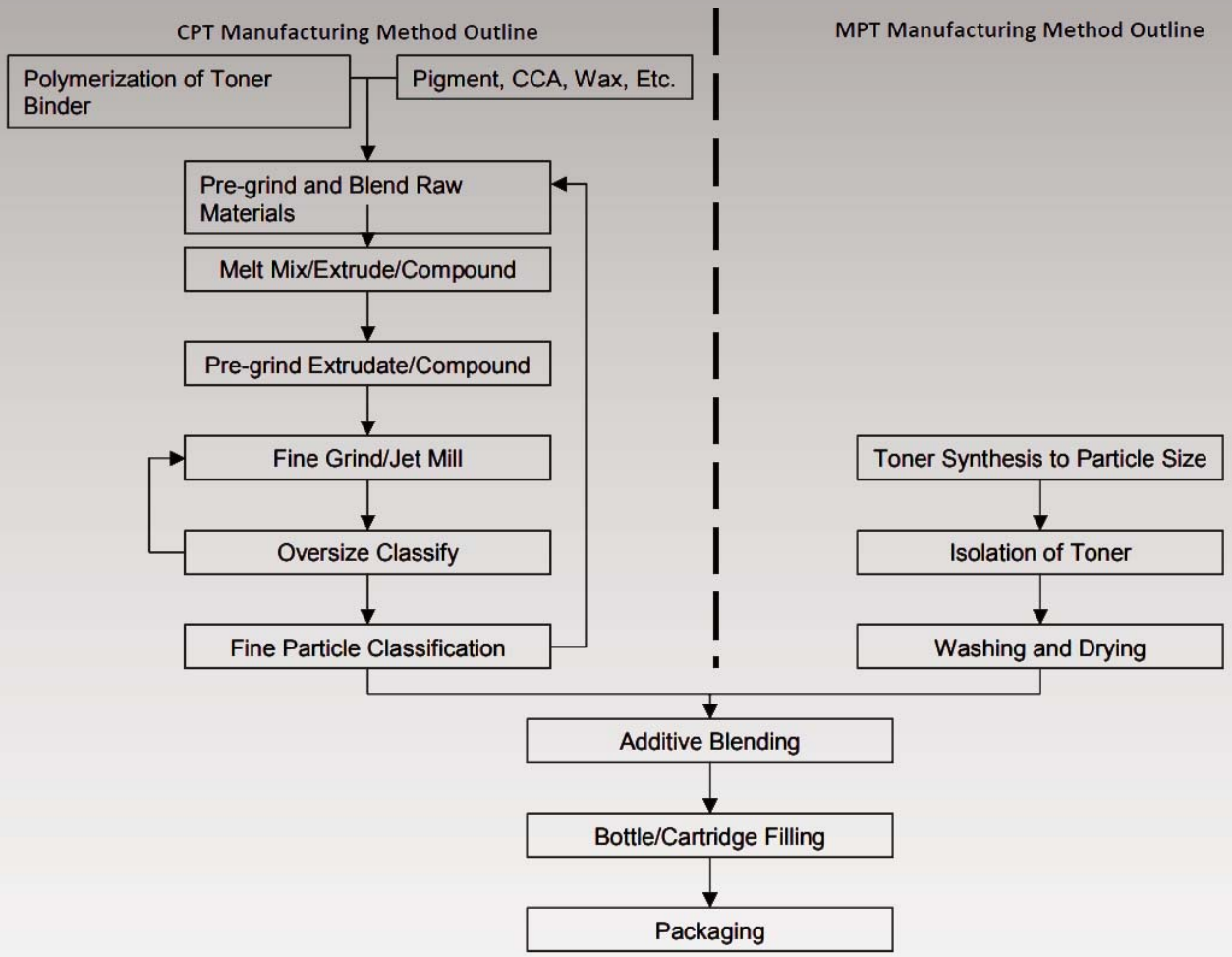


Toner

chrome?

Graham Galliford





In the printer's designed operation, the hardware, firmware and software make appropriate adjustments to the engine print parameters in order to ensure faithful creation of print result with respect to the original image.

With the assumption that the toner in use by the printer matches exactly the OEM toner characteristics, when printing, the input parameters determined by the printer systems are adjusted to achieve the desired color print results. These parameters are calculated by the system by measurement of the degree of development of toner on the drum or transfer belt in the cycle prior to actual printing. This measurement is then used to adjust the toner development in the print cycle. Parameters adjusted include toner development bias voltage on the drum. This pre-print measurement can be misguided if the toner in use is not closely matched to the OEM original toner. If the toners in use are not close in color or developed toner mass to the OEM the resultant print will not be an accurate rendition of the original.

Consequently, toner formulation and specification are crucial to successful color toner products.

Manufacturing Color Toner

Toner design, to a great extent, determines how they are manufactured. All manufacturing methods are capable of producing both monochrome and color toners. Well over 60 percent of global color toner production is by chemically prepared toner (CPT) methods as opposed to mechanically produced toner (MPT).

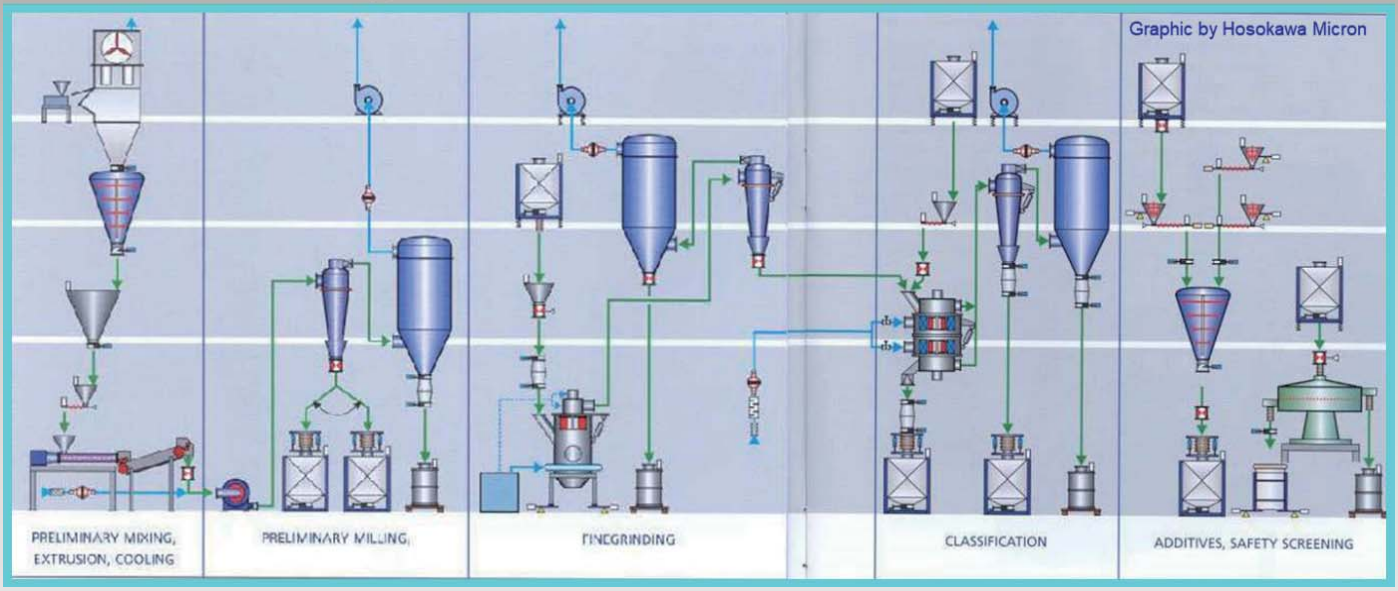
The choices made by individual producers in manufacturing technology, production equipment configuration and operational practices depend upon their market position, the availability of capital, the breadth of their product mix, the production volume, and the technical requirements of their target printer population. Toner manufacturers may be classified in market position as OEMs, OEM contractors, and independent/third-party/aftermarket manufacturers.

OEM Manufacturers of Color Toner

For OEMs, the drivers in color toner production are based on both print engine design and economics.

The drivers include the improvement of print quality, reduction of energy consumption in printers as well as in toner production all directed towards the minimization of the total cost of ownership (TCO) per page of printers. These drivers have led to OEMs adopting toner formulation and manufacturing methods to reduce fixing temperature, reduce mean particle size, and increasingly narrow particle size

Typical Plant Outline for MPT Manufacture



distribution of their toner. These drivers engender significant capital investment in toner R&D and production.

However, OEMs largely are not constrained by the availability of capital for the development of their manufacturing infrastructure so many have implemented the use of CPT technology. CPT addresses the ability to produce small particle, narrow size distribution low-temperature fusing products. CPT production cost is typically higher than conventional mechanically produced toner (MPT). For OEMs though, this higher unit cost can be substantially buried in the cost and pricing of cartridges.

OEMs manufacturing color CPT are Canon, Ricoh, Fuji Xerox, Xerox, Oki and Konica Minolta. Each has its own patented technology. Some OEMs produce both color MPT and CPT. Not all OEMs have adopted CPT however. Kodak, Punch, Kyocera Mita, Sharp and Toshiba notably have not and produce their own color MPT.

OEM Contractors producing Color Toner

Some OEMs subcontract their color CPT manufacturing to companies including Zeon Corp, Mitsubishi Chemical and Lotte. There are also some companies that contract manufactured color MPT for OEMs. These include Kao Corp, Tomoegawa, Tokyo Printing Ink and Fuji Denka Kogyo. The largest scale of these, Kao Corp, has been a contractor producing color toners for OEMs for many years.

Kao produces MPT with a median diameter of 5.5 microns using their proprietary MPT methods which, they claim, is able to produce the same image quality as CPT. Coincidentally, Kao is also globally the largest producer of the polyester toner binder resin, which is a key component for OEM color MPT. Kao has developed strong proprietary technology and capabilities in developing and producing low energy fusing high-quality toners.

Independent/Third Party/Aftermarket Toner Manufacturers

While the majority is produced in Japan by and for OEMs, color toner is being produced by many independent manufacturers around the world. The difference between these toners and the OEM products is that the raw materials and proprietary manufacturing technology used by OEMs are not readily available to the independents. This means that the all-important L*a*b* values for the toners when printed may not be the same as the OEM products. Consequentially these toners often produce the same image with a different appearance compared to the OEM.

Most independent producers are making MPT color toners but there are two independent manufacturers of color CPT, Hubei Dinglong and Fujifilm. The independent manufacturers producing color MPT include:

- **Mainland China:** ASC Technology (Beijing) Ltd., Zhuhai Guocai Technology Co., Ltd, Cangzhou Huibao toner Manufacturing Co., Ltd, Cangzhou ASC Toner Production Ltd, CET Group Co., Ltd., Everlight/ Trend Tone (Taiwan), GuangZhou Aumes Digital Technology Limited, Guangzhou VIVID Print Material Co.,Ltd., Guangzhou JSY CO. Ltd., Tianjin Synthetic Material Research Institute Co., Ltd. (Comet), ICMI (China) Limited, Wuqiao Huike Imaging Technology Co. Ltd., Nanjing Teshine Imaging Technologies Co., Ltd., Wuxi Jiateng Magnetic Powder Co., Ltd.,

Wuxi MeiLing, Real Color, Handan Hanguang OA Toner, Zhuhai Yifan Digital Technology Co., Ltd.;

- **Europe:** Integral GmbH, Imaging Products Manufacturing;
- **Japan:** Mikasa Sangyo Co., Ltd., Sakata Inx Corporation, Imex Co. Ltd.,
- **Malaysia:** Jadi Imaging Technologies Sdn Bhd;
- **South Korea:** Cosmo AM & T, Core Imaging Technology;
- **USA:** Color Imaging Inc., Raven Industries Inc.,

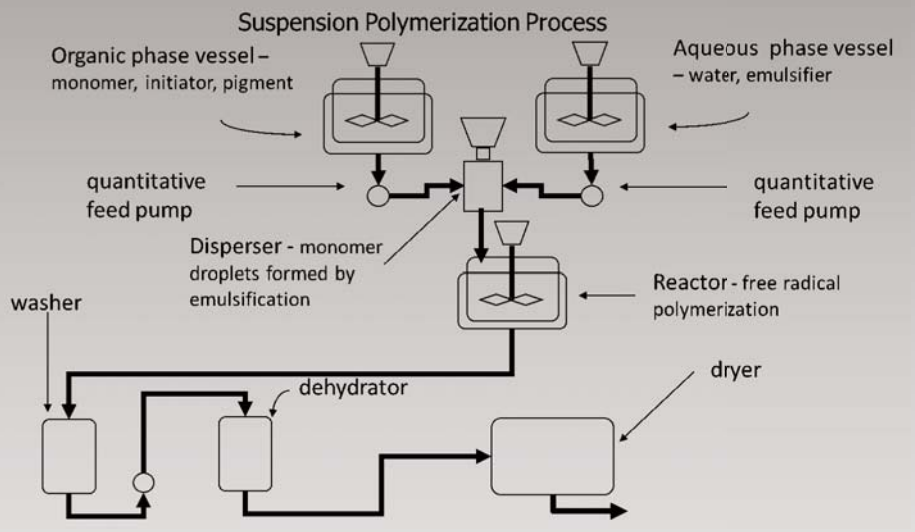
Toner Plant Design

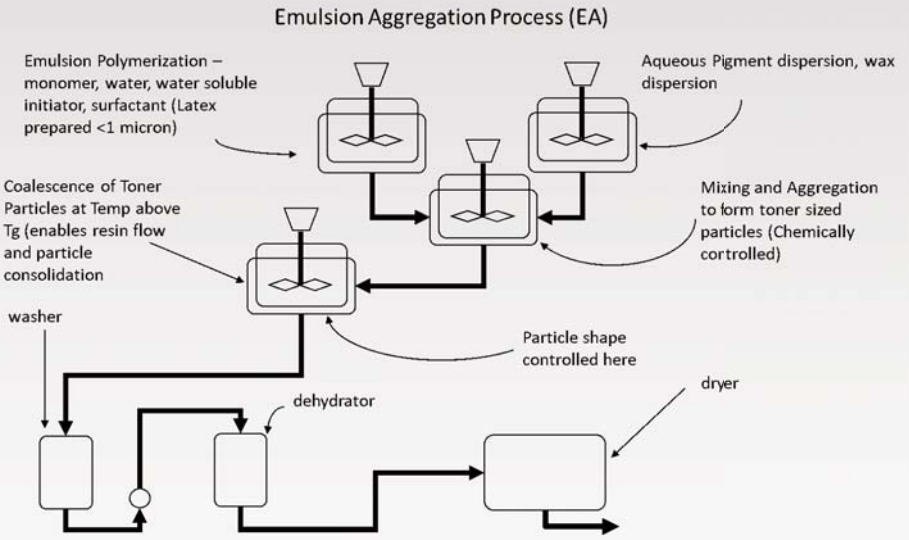
As can be seen in the diagrams (on P53), the plant used to manufacture MPT is quite complex and differs unsubstantially between manufacturers. The same type of plant can be used for both monochrome and color toner.

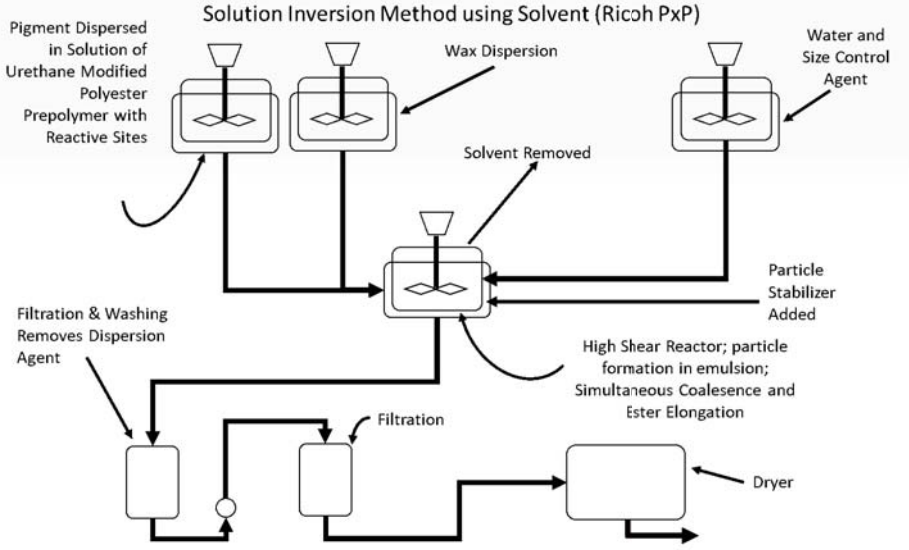
For color toner manufacturing, it is ideal to have at least one set of manufacturing equipment for each color. It is possible, however, to use one set of equipment for color toner manufacture by cleaning in between colors. However, clean down is an onerous time-consuming, costly task and can have a serious effect on product cost.

CPT manufacturing is also a complex multistage process.

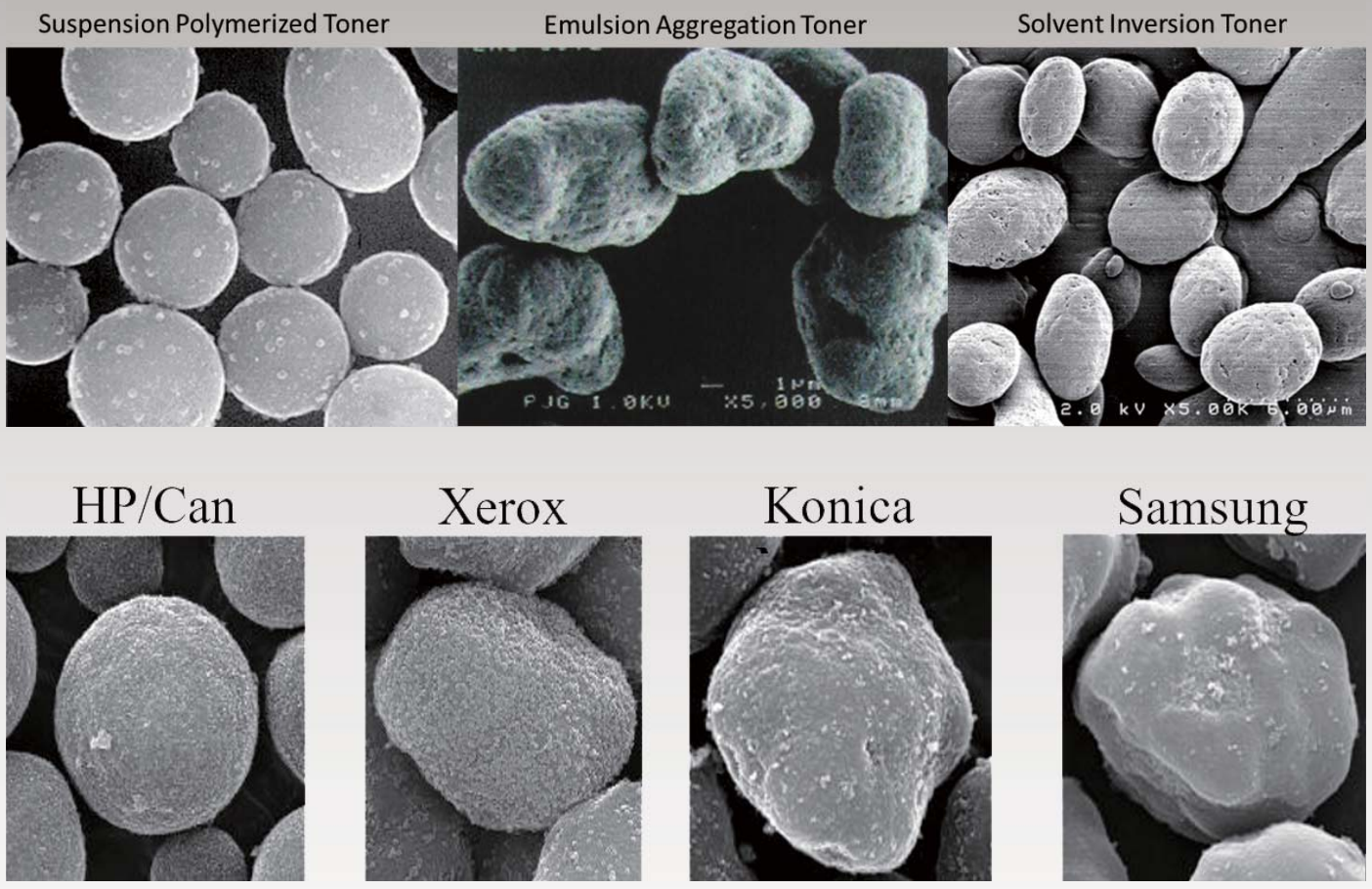
The plant design depends substantially on the type of CPT technology used most of which are proprietary to the manufacturer. The basic categories of CPT technology are suspension polymerization (used by Canon and Zeon), Emulsion Aggregation (used by Konica Minolta, Xerox/Fuji Xerox, Mitsubishi and Fujifilm) and Solvent Methods of which there a number of variants (used by companies including Ricoh and Xerox). There is no basic plant layout that can be illustrated because of the differences between each manufacturer's proprietary technology. However, the basic manufacturing process outlines can be illustrated as follows:







Scanning Electron Microscope (SEM) pictures of some typical CPT products made using the three methods and some commercial products are shown below:



All CPT manufacturing methods are based on the production of toner particles by growth in a liquid of some kind and as can be seen from the process outlines the final stages of washing, dewatering and drying of each process are very much the same. Techniques for these steps do however differ from manufacturer to manufacturer.

All have the common requirement to remove unwanted trace chemicals from the toner particle surface as surface trace materials can substantially affect the toner performance. In addition, the toner needs to be effectively dried to completion. CPT technology for the production of color toner is challenging and requires significant R&D and manufacturing investment and that is the reason only a few non-OEM companies have entered this technology field.

The Takeaway

A set of color toners is just one element of the color printing system but is vital in performance to enable faithful reproduction of any image. No matter the raw materials or production process used in an aftermarket color toner set, the close approximation of toner performance to the OEM product is the key to successful implementation.

This can be achieved by any of the production processes provided the raw materials are selected appropriately and that the specification and properties of the toner closely match that of the OEM. ■

Graham J. Galliford is a world-renowned consultant, researcher, writer and speaker for the global imaging industry. His work has encompassed technologies in a variety of printing components and products but has worked primarily in the field of toner-based printing technology since 1974. He can be contacted at <*graham@gallifordconsulting.com*>

Color Toner and the Th
—How Governments C

Dr. George Nubar Simonian is Dean in the Faculty of Design & Creative Arts - Ahram Canadian University. He is a Former Dean in the Faculty of Applied Arts - Helwan University. He is also the Head of the Egyptian Digital Printing Committee - Egyptian Chamber of Printing & Packaging and a Board member of the Egyptian Government's Printing Press. He heads up the Nubar Printing Press which has been a family business since 1939.

Digital color printers and presses have been around for a long time, but the real adoption started back in the mid-1990s when digital printing technologies and presses invaded the printing markets, starting with very limited applications and products. In a rapid, step by step progression, they have developed into a wide range of products to meet consumer needs.

For many years digital printing was under attack as being the easiest way to counterfeit and forge many security documents including certificates, stamps and checks as well as banknotes, passports and ID cards.

However, in a timely manner, digital printing and state-of-the-art modern presses have, on the contrary, moved from being the counterfeiting facilitator to being the counterfeiting deterrent and prevention.

Now, many extremely secure valuable documents and printed products are being printed using these new technologies with their unique capabilities and characteristics of on-demand, customized variable data printing and applications.

reat of Counterfeiting
ontrol It

Dr. George Nubar Simonian

Let's Take a Step Backwards

One of the most widely used digital printing technologies for document copying and printing is the electrostatic (laser printing with toner) process. It begins with a photo conducting surface that is uniformly statically charged. In many copiers and printers, this is a metal plate with a Selenium-based coating. The charged surface is then exposed to an image of focused light, usually from a laser or light-emitting diode LED. This image is the image to be printed, where the light falls, the charge dissipates and a "charge image" of the light image remains on the photoconductor surface.

The image is developed by dusting the charged surface with a pigmented charged powder, called toner, which is attracted to the charged areas of the image. The toner is then transferred electrostatically to paper and, finally, is fused to the paper using heat. A continuously rotating metal drum moves the plate and paper through the various steps (charging, exposing, developing, and transferring) in a seamless manner. The quality of electrophotographic images has improved continuously since its introduction in the mid-1900s. The critical elements of electrostatic technology for counterfeiting are the development, transfer, and fusing steps, which control the image quality and are also where advancements have resulted in higher quality and lower cost.

There are two different types of toners, each yielding slightly different print characteristics; dry toners, which are the most common, and liquid toners. There are four main differences between dry and liquid toners (Kipphan,2001).

1. Particle size: dry toner particles are larger in size (6 - 20 um), liquid toner particles are smaller (<2um).

Counterfeiting technology follows digital reproduction technology trends.

2. Ink layer thickness: dry toner ink layers are thicker (5-10 um), liquid toner layers are thinner(1-3um); ink layer thickness is relative to the size of the particles.

3. Toner carriers: dry toner uses particle carriers to carry the toner throughout the process before melting. Liquid toners use a carrier liquid for this process.

4. Due to the nature of the toners, each requires different processes for fixing the toner to the substrate. Dry toners require pressure or heat. However, liquid toners require an evaporating process such as pressure, heat or anchoring to remove the carrier liquid.

Key Characteristics of Electrophotography:

- Typically, a granular appearance is visible with each color (C, M, Y, and K) being a separate and different granule; stray toner particles may be visible in non-image areas; seen as color/black speckles;
- Speckles may be more frequent around the edges of image areas and text;
- Since heat is commonly used to secure toner, toner areas may appear "melted" or slightly glossy;
- Substrates are limited because of the risk of melting;
- The surface area should feel as if it had uniform smoothness;
- Particles of toner that are not properly fixed to the substrate may come off (Lamer & King, 2004).

A range of excellent, reliable, and cost-effective digital printers for consumer use are available today at very affordable prices. Innovation and skilled engineering have resulted in this progress.

Counterfeiting

With the growth of new technologies in the printing industry, the growth of counterfeiting and forgery has also increased.

Counterfeiting involves multiple products, including currency, checks, identification documents and packaging and is also a problem of global proportions. Counterfeiting damages economies and business and harms individuals. However, organizations are in a constant state of developing new technologies to thwart counterfeiters. They are also continually educating their employees to be better at identifying print processes and counterfeit items.

Counterfeiting technology follows digital reproduction technology trends. In 1995, for example, less than one percent of counterfeit notes detected in the United States were digitally produced. However, within just 10 years, that number had grown to nearly 35 percent worldwide and 54 percent within the United States.

Many experts classify criminal activity in this arena as follows:

1. Primitive: those who use manual artistry and crafting supplies;

2. Hobbyist: those who use electronic devices and crafting supplies commonly found in homes, offices, and universities;

3. Petty criminal: those who deliberately seek commercially available materials to augment available digital processes;

4. Professional criminal: this person has the means to manufacture special materials or to appropriate controlled materials;

5. State-sponsored: where protected organisations have the full resources to duplicate all technologies.

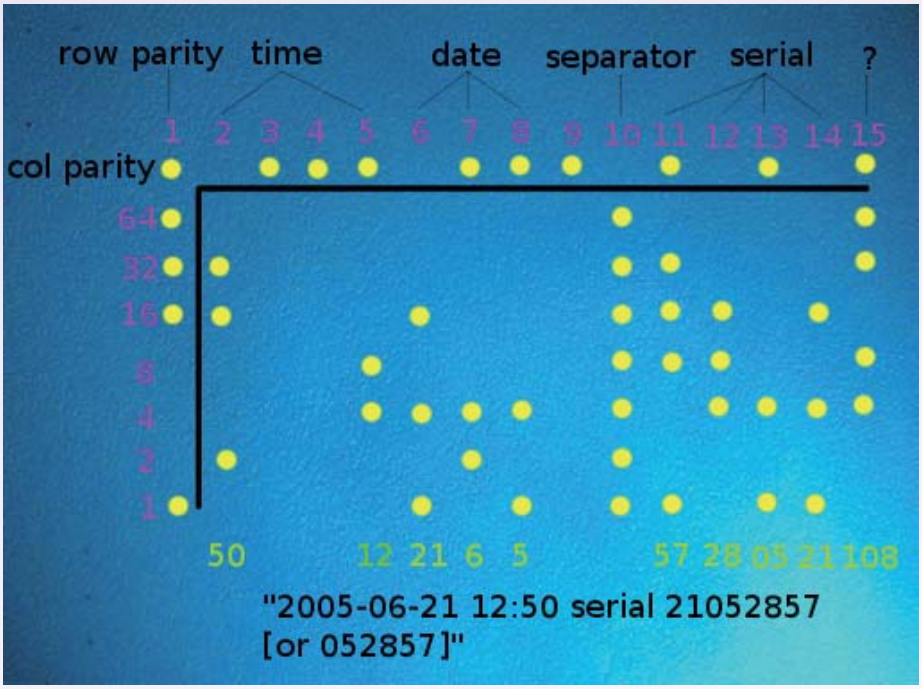
All major manufacturers of color laser printers have entered into "secret" agreements with governments to ensure that the output of those printers is forensically traceable.

Governments are continuously trying to control the access and usage of color printers and digital presses, through a variety of approaches, for example:

1. **Rules and legislations**:

a. Manufacturing counterfeit United States currency or altering genuine currency to increase its value is a violation of Title 18, Section 471 of the United States Code and is punishable by a fine or 15-years imprisonment, or both;

b. Printed reproductions, including photographs of paper currency, checks, bonds, postage stamps, revenue stamps, and securities of the United States and foreign governments (except under the conditions previously listed) are



violations of Title 18, Section 474 of the United States Code. Violations are punishable by fines or 15-years imprisonment, or both;

c. The Egyptian parliament reported that its industry committee will be establishing a new law to increase and reinforce the penalty for counterfeiting products and brands.

2. **Special Departments**: In Egypt, for example, we have a very well-organized system with a special department in the Ministry of Interior. This entity deals with all issues related to color printers and digital presses. Every single printer or press must be registered at the time it's imported into the country. Its serial number along with the purchaser's and user's information is recorded in order to track everything very easily and efficiently.

3. **Cooperating with manufacturers**:

Electronic Frontier Foundation (EFF)

Some of the documents that we previously received through the Freedom of Information Agency (FOIA) suggested all major manufacturers of color laser printers have entered into "secret" agreements with governments to ensure that the output of those printers is forensically traceable.

Since late 2004, EFF has been warning the public about "printer dots" — tiny yellow dots that appear on documents produced by many color laser printers and copiers.

These yellow dots form a coded pattern on every page the printer produces and can be used to identify specific details about a document; for example, the brand, model, and serial number of the device that printed it and when it was printed. In short, the printer dots are a surveillance tool that can link each printed page to the printer that printed it. (see: *eff.org*). ■

IN MY VIEW

How important is color in your business?

Russia

Alexey Belikov
General Director, CUHDO Ltd

With more color printers and MFPs out in the field, more supplies needed. It's obvious. This is true for both ink and toner technologies. Color cartridges have a significant share in our business, mainly due to high-quality cartridges. Russians now want higher quality, so we supply the market under our UNITON Premium brand. They comply with environmental safety requirements as well as ecological issues that have become a hot topic in Russia.

Singapore

Ricky Lee
Senior R&D and Sales Support Manager, EOP21 Pte Ltd

Color is core to our corporate identity. Our brand logo comprises CMYK, Gold and Silver, representing our toner business, which is a reflection of life. We are associated with color toners every day: raw materials and color toner products to print on the copiers and printers. Color goes to the heart of our product quality and our business recognition in this imaging supplies industry.

Japan

Iemori Kanetoyo
Sunwise Information Corporation

Color is very important for us because our business is in the publishing of market research reports to our clients. For our clients to receive a profound impression on our reports, we need to insert many color graphic charts. Monochrome graphic charts cannot make the same impact when compared with color. As you can see, good quality, consistent color is totally indispensable for our reports and in turn, our business.

Where is the

Color in the Latin aftermarket has been through a series of different stages.

It enjoyed an initial promising future. Then it endured a period of inconsistent quality with products and supplies.

Today, there are reliable and profitable options for those who know how to understand the dynamics of this market.

Although color is present in all segments, its concentration could be divided into two: a corporate and commercial sector with a demand for very high-quality equipment and supplies, with a significant OEM participation. The other segment is the consumer market in need of color printing, but with a greater focus on cost than quality.

Of both segments, corporate is certainly the one that offers the best business opportunities. However, the high-quality standards and strong OEM presence make it a tough mountain scenario for most aftermarket companies to climb.

Vladimir Bossini, Executive Director of Tecnotoner—one of the most important remanufacturing companies in Brazil—warns, “The color market in Brazil is divided into two: the Business Color market and the High-end market. Both have been growing since costs have fallen over the last few years. While the Business Color (low-end) market is more susceptible to large variations in quality and performance, the High-end has seen good products offered by fewer companies that know how to work and develop products for this segment. This market is a great opportunity for remanufacturers and manufacturers who can focus on quality.

In regards to quality, Bossini affirms, “It is not related to technology today, but to how much knowledge you have and good raw materials.” He points out that although the OEM is a reference, “it is not necessarily an example of quality.” As for the clients that Tecnotoner is looking for, "they are in the high-end market since the low-end is being served by several importers who sell by price and we have no interest in competing with that market."

Mexico faces the same market scenario. María Dolores García Ramos from Fixsell del Norte admits, "Color has grown a lot in the Mexican market. Almost every brand has corporate color equipment. The aftermarket has moved quickly to remanufacture the cartridges and to sell generic consumables." As for the type of devices, she says, "Graphic arts equipment has grown in demand, but there are still not many generic consumables for them."

In Argentina, there are aftermarket companies that have been developing solid solutions for the color corporate segment over many years, particularly in the information technology sector.

According to CEO, Ezequiel Gismondi, “an alliance with a toner factory in Japan” has helped them

“Quality is not related to technology today, but to how much knowledge you have and good raw materials.” —Vladimir Bossoni, Executive Director of Tecnotoner Brasil

"We serve many clients with CPP, printing and diagnostic imaging contracts" —Ezequiel Gismondi, CEO of the Argentine IT Sector

Color?

Gustavo Molinatti

serve many clients with cost-per-page (CPP) contracts, printers and diagnostic imaging, mostly using "high-quality Ricoh and Minolta devices, both in A3 and A4." As for the corporate lines with small and medium equipment, they provide "chemical toner from a factory in China and supplies, mostly for HP, Samsung, Okidata and Brother."

Colombia is another market where solid aftermarket companies enjoy business in the corporate color sector.

Jorge Peña from ABKA Colombia S.A.S acknowledges, "Monochrome prints have drastically decreased profit margins, so we see color as a great opportunity to reverse losses."

According to Peña, the same sales in color can be obtained as with the large volume of monochrome prints. He clarifies "the color market is wide and includes clients such as hospitals, laboratories, designers, education, exhibition fairs, human resources, security and stamping."

In his company they commercialize both compatible and remanufactured products, reaching OEM quality in both cases. "The most profitable brand in the Colombian market is Ricoh," says Peña. "There is a good cost-benefit with the very practical multifunctional devices".

Carlos Enzler, CEO of Qualiprint Colombia, is assured color printing has changed significantly in recent years in Colombia. It has coincided with Epson achieving high sales records on its Ecotank continuous ink model—a device designed for individuals but which was also welcomed in the SME and MicoPYME sector for its cost savings and competitiveness when compared to original and generic laser consumables."

"Color opens the portfolio, allowing the end consumer to print high-quality material that previously could only be done in specialized printers"
—Jorge Peña from ABKA Colombia.

"The color laser is concentrated in medium and large companies while the color inkjet is in consumers and SMEs"
—Carlos Enzler, CEO of Qualiprint Colombia (right) at the 2019 RT VIP Expo in Bogotá.

As the market prioritized cosy over quality or speed, "many chose to change the printer when it was time to change the four toners," Enzler explains.

As said at the beginning of this article, this is a market segment that focuses on price ahead of its commitment to quality. Consequently, the migration to tank-based inkjet devices has generated a sustained increase in shipments throughout the Latin region in recent times.

"Currently, color laser is concentrated in medium and large companies while color inkjet is with private individuals and SMEs," adds Enzler. "In the past, customers in this segment attached importance to product quality, especially color, but today it is very different, they want it to work and perform." ■

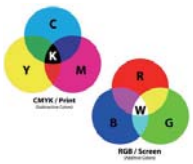
Gustavo Molinatti

RT Global Partner for Latam

Molinatti is based in Buenos Aires, Argentina and is publisher of Guía del Reciclador—the Spanish language magazine first published in 2002 for the Latin American printer cartridge aftermarket. He has organized more the 20 technical and MPS training events in several countries and is helping RT bring VIP Expo events to Brazil, Argentina, and Perú. Please contact <info@guiadelreciclador.com>

DID YOU KNOW?

Each pixel on a monitor or TV screen is composed of three small dots called phosphors surrounded by a black mask. Three colors of light (red, green, and blue) are generated and displays will reflect at least 256 different colors—with some displaying millions.



RGB is the color you see on your televisions, computer monitors, phones, and tablets while CMYK colors are specifically used for printing.

The letter K—in CMYK—stands for "key." Black is usually the color of text and image borders so by printing them first it makes it easier to line up or "key" the other colors in the print job.

Color depends upon light so if you darken or lighten a color you actually change it to a different color.

George Baxter was an English artist and printer based in London and is credited with the invention of commercially viable colour printing. Though colour printing had been developed in China centuries before.

The first successful color printout occurred in 1977. In 1978, Xerox released the world's first color copier, which printed in single, alternate colors. Then came the commercial sale of dot matrix, inkjet and laser printers.

BERTO'S LAST LAUGH

REACH THOUSANDS GLOBALLY WITH YOUR BRAND

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Nashua® has engineered and tested a range of toner cartridges for use in Brother®; Canon®; Dell®; Epson®; Hewlett Packard®; Konica Minolta®; Kyocera®; Lexmark®; Oki®; Ricoh®; Samsung® and Xerox® devices.

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