



Information Technology Industry Council
Leading Policy for the Innovation Economy

Industry Presentation before the

Task Group on Printer Ink and Toner Cartridges

NCWM Annual Meeting

July 17, 2011

Missoula, MT

Who We Are

- ITI is the premier voice, advocate, and thought leader for the information and communications technology (ICT) industry.
- ITI's members include the leaders of printer manufacturing technologies
- Companies have been engaged at NCWM
 - Published white paper
 - Participated in 2 years of NCWM Annual, Interim and various regional conferences



Today's Presentation

- Revisit the proposal and its objectives
- Share industry's perspective
- Discuss customer needs
- Highlight technical considerations
- Address assumptions driving the proposal
- Answer your questions



What is the Objective

- Starting point of NCWM discussion *seemed* relatively simple: addition of volume and weight measurements to ink jet printer cartridges and laser toner.
- “The purpose of this proposal is to specifically clarify the requirements for industry, consumers, and weights and measures officials...”
- The objective is finding the best way to accomplish this: yield or volume/weight?



Industry Position

- We agree with the main objective of this proposal: providing consumers with a meaningful measurement of value.
- We believe the most meaningful measurement is yield, not volume or weight.
- Volume and weight may lead consumers to draw incorrect conclusions about product choice.
- There are international, globally-adopted standards for yield that provide a common, well accepted basis for consumers to understand and compare different cartridge options.



Presentation Outline

- Customer needs are better served by yield information
 - David Erdtmann, Kodak
- Technical factors make weight/volume comparisons misleading
 - Henry Sacco, Brother Int'l.
- ISO/IEC Standards provide a reliable, adopted basis for reporting cartridge yield
 - Paul Jeran, HP and ISO/IEC Standards Editor/Convener



Customer Needs



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Customer Focus

- When purchasing printers customers consider many factors:
 - Reliability
 - Printer price
 - Product specifications – speed, copying, scan, fax, wifi, duplex capability, paper tray capacity
 - Compatibility with existing equipment
 - Brand name
 - Consumer and industry reviews
 - Footprint
 - Retail availability
 - Cartridge attributes



Customer Focus

- Customer cartridge attributes considered
 - Reliability
 - Price of replacement cartridges
 - # of pages per cartridge
 - Cost of operation/running cost
 - Quality – photo, durability
 - Easy to insert cartridges
 - Tri-color compared to individual cartridges
- Goal - Help customers make comparisons and informed decisions



Customer Comparisons

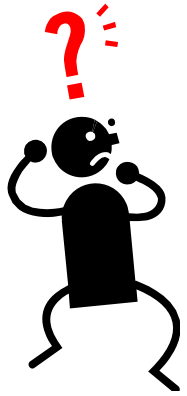
2 purchasing occasions for customer comparisons:

1. Initial printer purchase
2. Replacement print supply purchase



Customer Experience

Comparisons across technologies



Inkjet



Laser



???

Measure

15ml

200g

2 sticks

Yield

300 pages

2000 pages

700 pages

Price

\$18

\$65

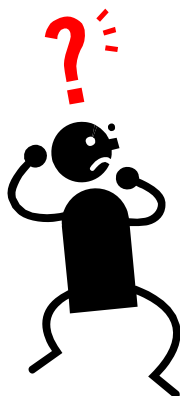
\$22



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Customer Experience

Comparisons within a manufacturer



Alpha 100



Alpha 200



Alpha 300

Measure

65g

300g

960g

Yield

3000 pages

6000 pages

14,400 pages

Price

\$60

\$120

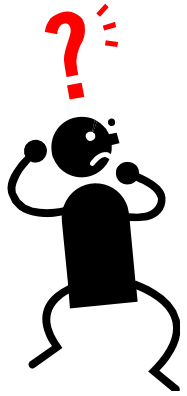
\$144



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Customer Experience

Comparisons across generations



2004 Model



2008 Model



2012 Model

Measure

35ml

25ml

17ml

Yield

300 pages

335 pages

350 pages

Price

\$18

\$15

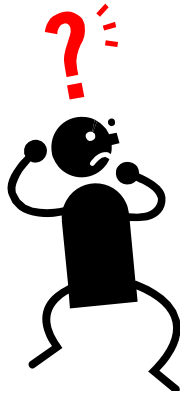
\$15



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Customer Experience

Comparisons between manufacturers



Mnfg: Alpha



Mnfg: Delta



Mnfg: Lambda

Measure

45ml

10ml

17ml

Yield

310 pages

205 pages

350 pages

Price

\$18

\$12

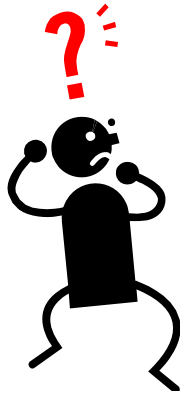
\$15



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Customer Experience

Comparisons across cartridge suppliers



**Standard
Black**



XL Black

Measure

4ml

6ml

Yield

200 pages

600 pages

Price

\$15

\$30



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Technical Factors



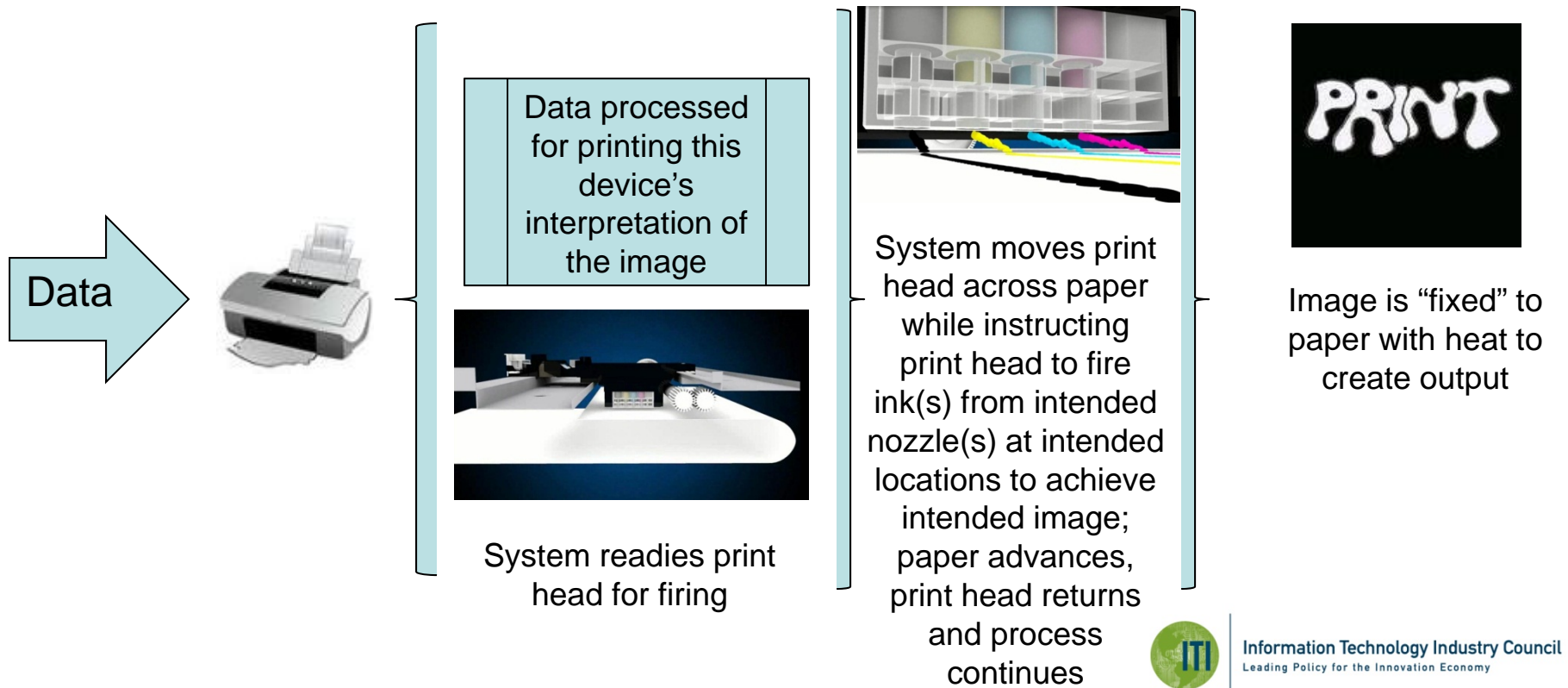
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Technical Factors

- In order to understand what information is important to the consumer and necessary to make price and quantity comparisons, there needs to be an understanding of the various printing technologies.
- The following technical discussion also highlight the challenges and drawbacks of requiring volume and weight declarations on ink and toner packages.

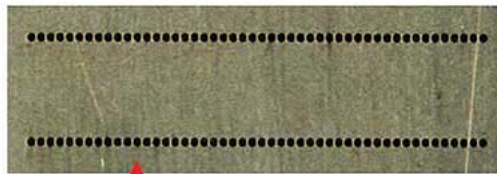


How does the Inkjet Printer process work (Simplified Operation of an Inkjet Printer)

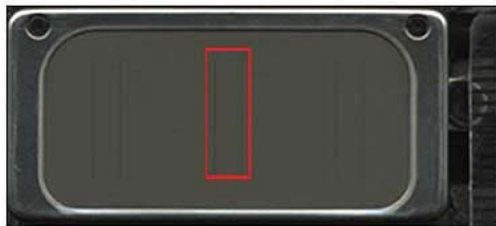


Inkjet Print Head Detail

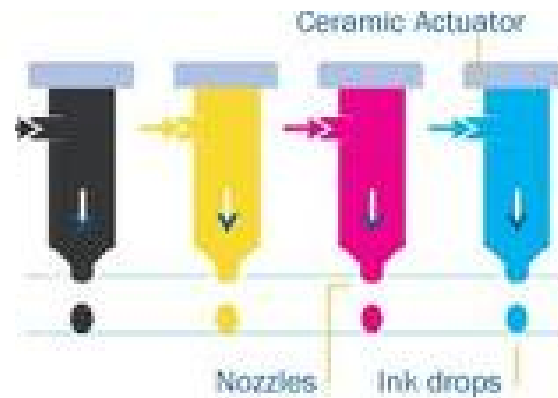
PRINT HEAD NOZZLES



Magnified



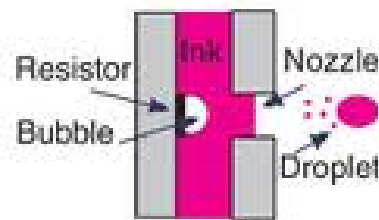
PIEZO TECHNOLOGY



For illustration only. Actual size not shown.

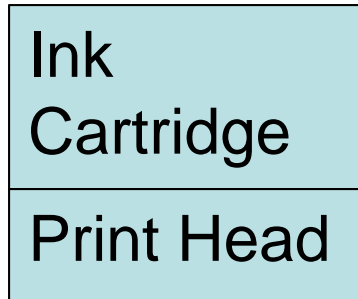


THERMAL TECHNOLOGY

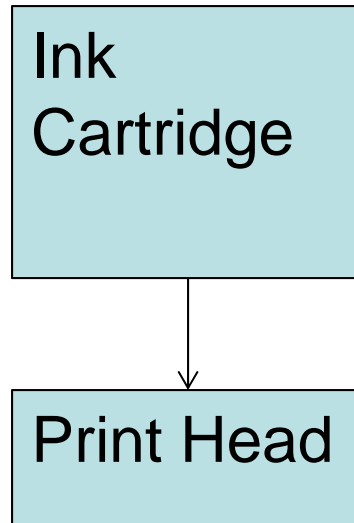
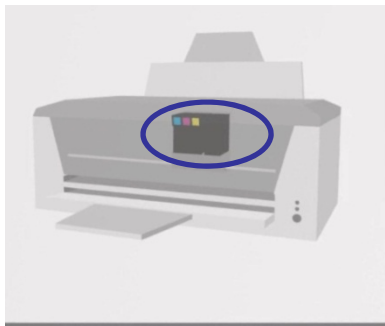


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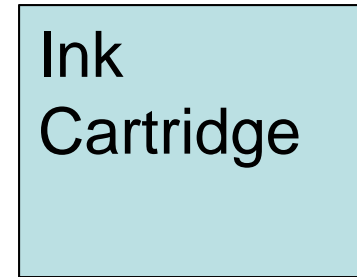
Inkjet Cartridge/Print Head Designs



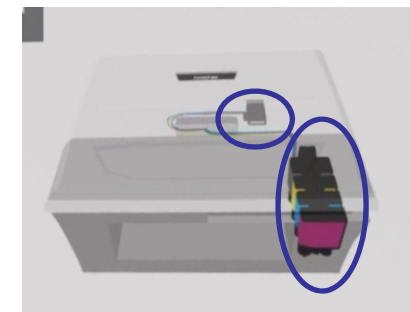
Conjoined
Replace Print head with cartridge



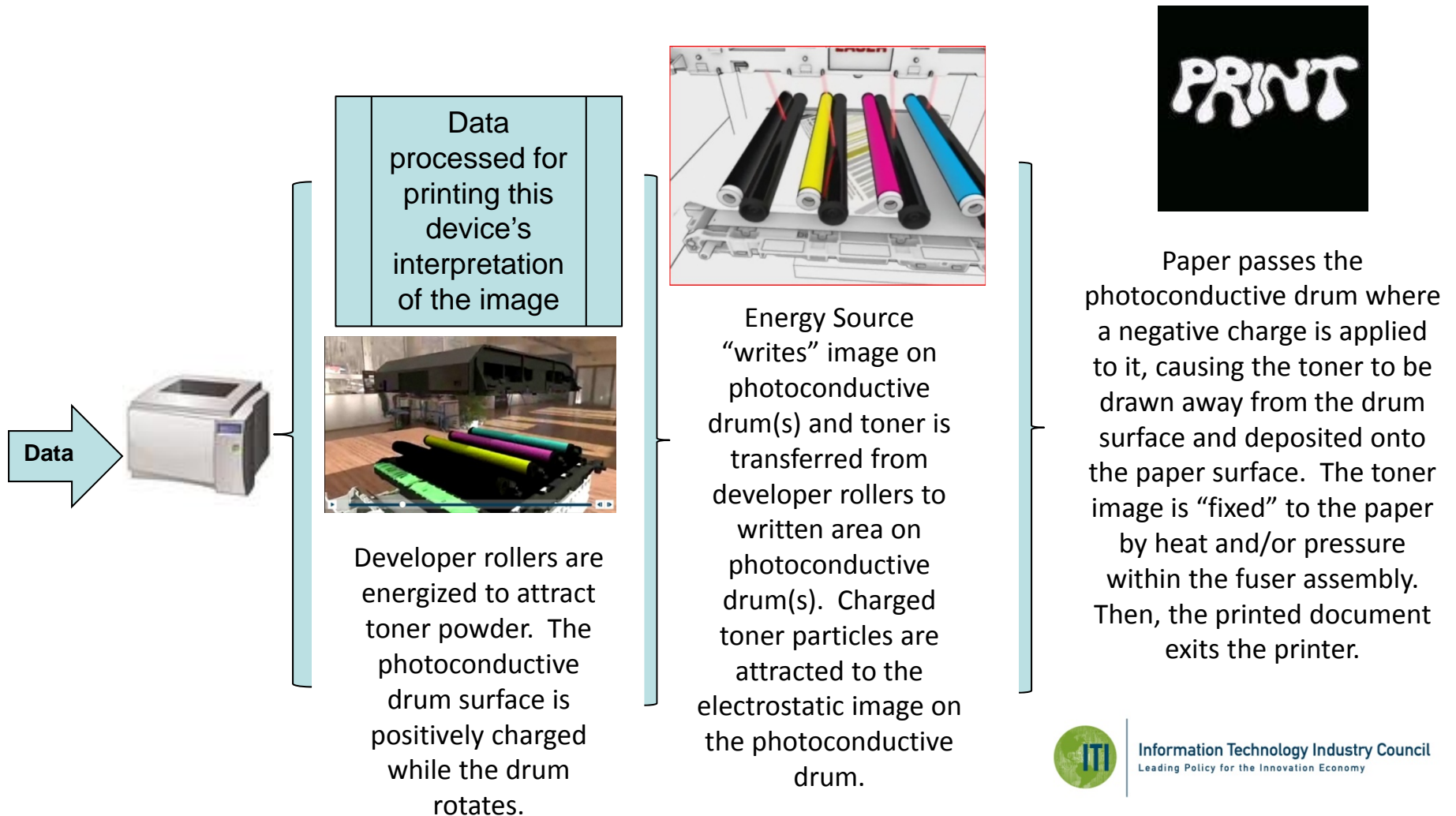
On Carriage
Cartridge(s) on carriage with print head(s) but separately removable



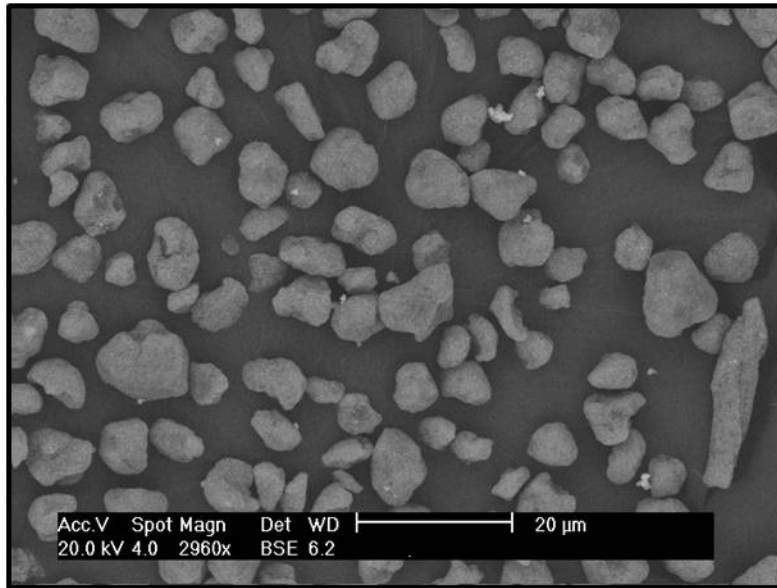
Off Carriage
Cartridge(s) not on carriage with print head(s) - separately removable and located farther away



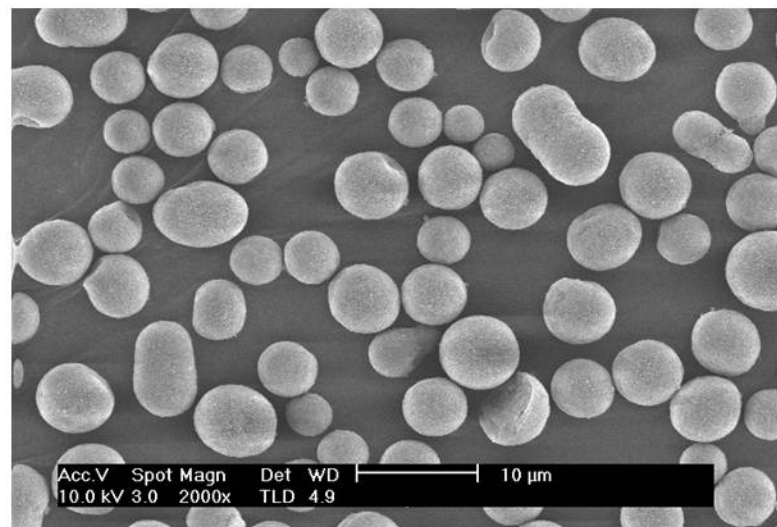
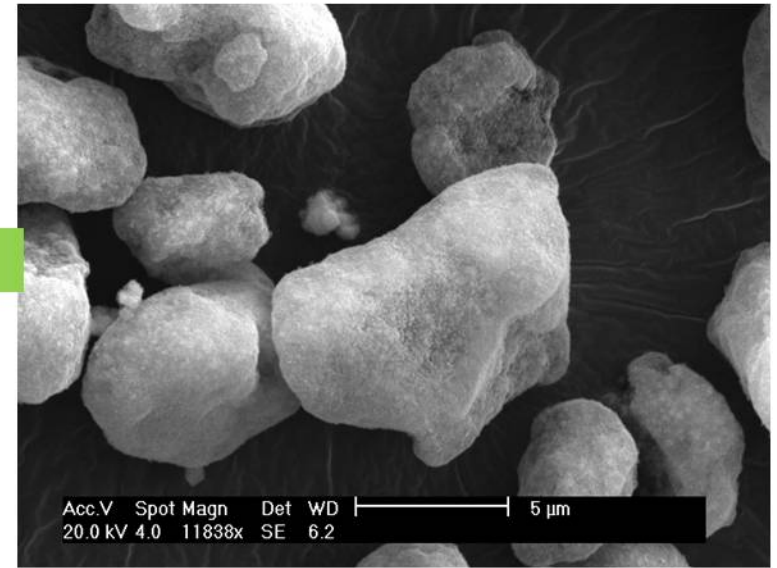
How does the Laser/LED Printer process work (Simplified Operation of a Laser/LED Printer)



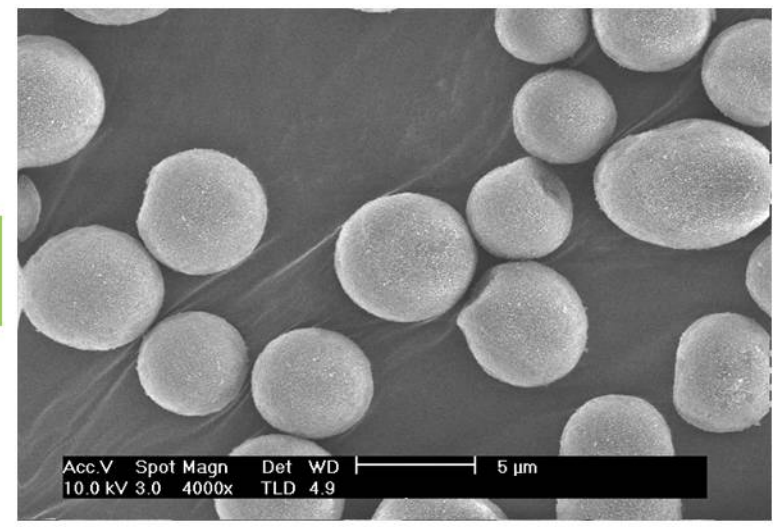
Toner Technology - Jet milled vs. Chemical toners



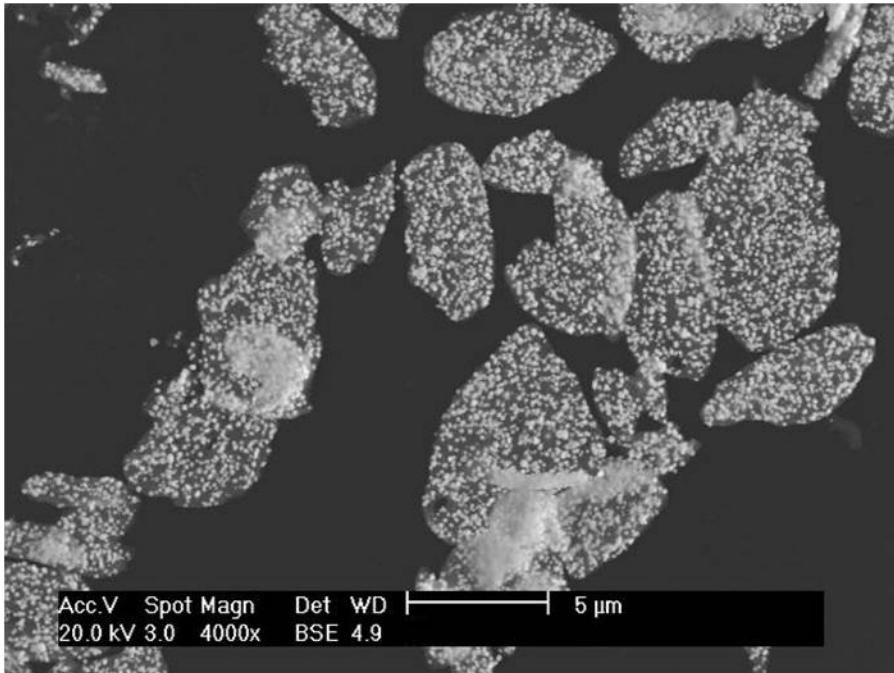
Jet milled toner



Chemical toner

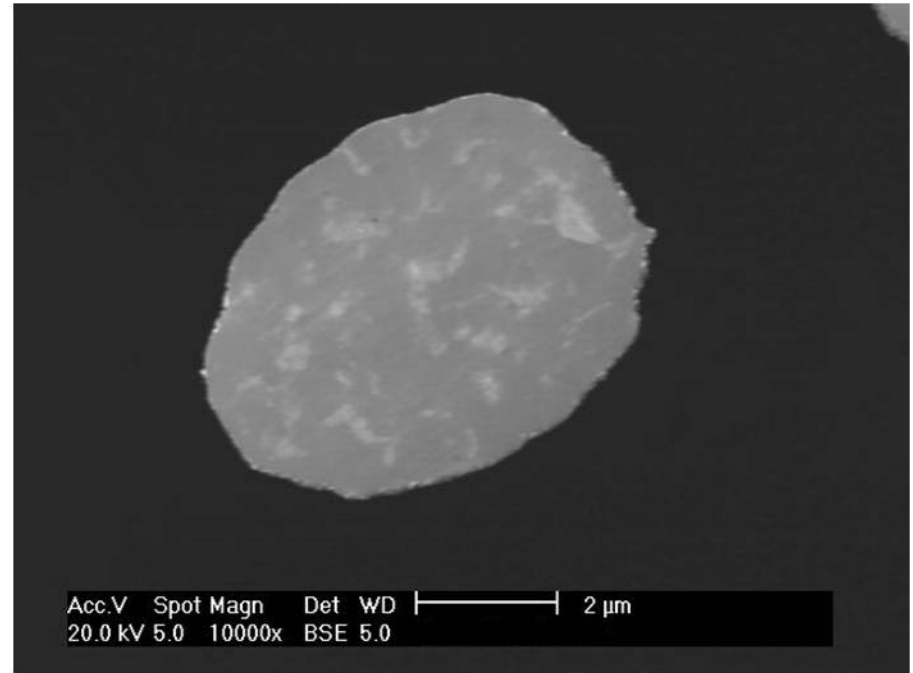


Toner Density



This is a x-section of the monochrome toner. The white specks within the toner particles are Iron oxide particles which accounts for 49-50% of the weight of toner.

The density of this toner is approximately 1.4-1.5 g/cc.



This is a x-section of a black color CPT toner. The color toners does not contain Iron oxide and is primarily 98-99% polymer.

The density of this toner is approximately .98-1.0 gm/cc.



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Customer experience based on density impact on yield

- Potential fill volume of 200cc (volume constant)
 - Chemical toner = 100g = 8.0K ISO Pages
 - Jet milled toner = 133g = 2.7K ISO Pages
- Potential fill of 200g (weight constant)
 - Chemical toner = 8.0K Pages
 - Jet milled toner = 4.0K Pages

**Weight or volume measure of toner can mislead
to actual delivered value**

Based on:

- 40 pages/gram for chemical
- 20 pages/gram for jet-milled



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Technical Challenges with Toner

- Different toners have different density
- Different toners have different pages/gram efficiency

Grams	Pages	pages/gram
440	10560	24.0
300	4800	16.0
340	7200	21.2
300	8400	28.0
1050	21600	20.6
690	14400	20.9
1140	45600	40.0
65	3000	46.2

Most likely Jet Milled

Most likely Chemical

Based on several web site reports

http://www.uninetimaging.com/downloads/technical/TecArtWebAdded/Canon_LBP_EX_EP_E_Toner_Summit_Web.pdf

http://www.collectingcanada.com/ibm_4019_29.pdf

<http://ezinearticles.com/?How-To-Properly-Remanufacture-Your-HP-Q1338A-Q1339A-Black-Toner-Cartridge-In-Just-53-Easy-Steps&id=106439>

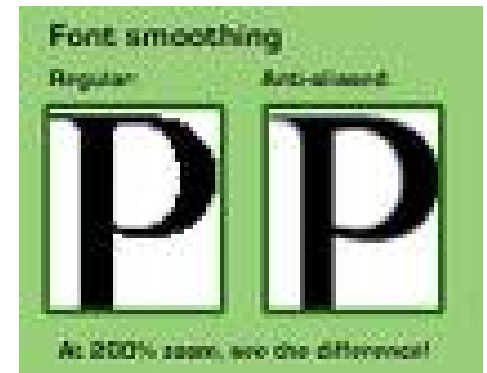
http://www.priceless-inkjet.com/cartridge/RI_887640.html

<http://www.iwt.kiev.ua/files/samsungml-1210.pdf>

Inkjet and Laser/LED Technologies

Some **OEM design choices** that have an **impact** on **both ink and toner consumption** and which may make ink volume and toner weights misleading...thus, **not allowing price and quantity comparisons between products.**

- **“Anti-Aliasing” or “Smoothing”**: Techniques for smoothing the edge of the printed image. Depending upon the OEM device design, more or less ink/toner may be used in this “smoothing” process.
- **“Color Mixing”**: Techniques used for mixing colors can impact ink/toner consumption – richer colors probably means more ink/toner. Certain OEM devices may mix colors differently based on the type and concentration of the ink/toner.



Inkjet and Laser/LED Technologies

Some **OEM design choices** that have an **impact** on **both ink and toner consumption** and which may make ink volume and toner weights misleading...thus, **not allowing price and quantity comparisons between products.** (cont.)

- **Black vs. "Composite" Black**: In some cases, the devices may print additional color(s) under the black to make it darker, more dense ("Under Color Addition" or UCA).
- **"Gray Component Replacement" or GCR**: In some cases, devices may print by replacing some percentage of Cyan, Magenta, and/or Yellow ink/toner with a corresponding percentage of Black in order to reduce the overall ink/toner usage.



Inkjet and Laser/LED Technologies

Some **OEM design choices** that have an **impact** on **both ink and toner consumption** and which may make ink volume and toner weights misleading...thus, **not allowing price and quantity comparisons between products.** (cont.)

- **Printing with more than 4 colors**: In some cases, such devices may print by replacing some percentage of Cyan, Magenta, and/or Black ink/toner with a higher percentage of Light Cyan, Light Magenta, and/or Light Black (Grays) in order to improve pastels and image highlights.



Inkjet and Laser/LED Technologies

Summary of factors that may contribute
to misleading volume or weight

Inkjet

- Technology
- Print heads/drop weight
- Proprietary Ink Jet Nozzle Plate Designs
- Proprietary Ink Jetting Algorithms

Laser/LED

- Developer rollers:
- Toner recapture vs. waste toner
- Proprietary Toner Algorithms:

Inkjet and Laser/LED

- “Anti-Aliasing” or “Smoothing”
- “Color Mixing”
- Black vs. "Composite" Black
- "Gray Component Replacement" or GCR
- Printing with more than 4 colors



ISO/IEC Standards



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Meeting a Need: Developing an ISO Standard

- Prior to the development of a standard for yield, each manufacturer advertised their cartridges' delivered value using various methods
 - proprietary yield measures
 - weight or volume
 - nothing
- There was no way for customers to assess the relative value of cartridges between printers or even for the same printer.
- ISO was developed to provide that measure.
- Has been adopted world wide as the best measure available for reporting delivered cartridge value



What the yield standard is and is not

- Well defined method to measure and report the yield of a set of cartridges in a printing system
- Takes into account variation in printer and cartridges
- Carefully controls, environment test files and end of life
- Tests cartridges using a user-like page and end-of-life
- It is NOT a guarantee of a specific cartridge's yield performance



In Summary

- Dean Gallea, Head of Computer Testing at Consumer Reports

“...manufacturers should focus on the number of pages you can print rather than how much ink each cartridge contains... the number of pages that you get per unit volume of ink can vary between the different ink formulations and different manufacturers, so its not a clear indication of what the page count would be.”

Jan 22, 2010, on Marketplace, National Public Radio



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In Summary

- Based on the goals of NCWM (and those in Handbook 130), weight and volume will not meet the objective, but quantity and yield will.
- Industry has already begun transitioning to use of the ISO/IEC standards.
- These standards are a better measure than weight/volume for consumer information and product comparison.



Thank You

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