

## Appendix C

### Item 232-2: Handbook 130, Method of Sale of Regulation

#### Section 2.13.4. Declaration of Weight Packaged Printer Ink and Toner Cartridges

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March 17, 2009

Mr. Max Gray  
Department of Agriculture and Consumer Services  
Bureau of Weights & Measures  
3125 Connner Blvd. Lab 2  
Tallahassee, FL 32399-1650

Dear Mr. Gray:

Thank you for providing the inquiry from cartridge refiller Dr. Ink, Inc., as well as the link to Tom Coleman's newsletter article dated March 2005. As we discussed briefly, Lexmark does not believe that the packaging for inkjet print cartridges is required to display the volume of ink contained within those devices. Lexmark also believes that despite some superficial appeal, such labeling is more apt to be misleading than illuminating to consumers.

#### Background

An inkjet print cartridge is not remotely similar to a bottle of milk or a tube of toothpaste; rather, it is one of the most technologically advanced micro-machines in commerce today. In fact, most of the sophisticated technology that comprised a printer in prior technologies is now contained within the print cartridge itself. Not surprisingly, then, the cost of the ink associated with a cartridge is a very small fraction of the total cost of the print cartridge mechanism and much of the price the customer pays for the cartridge is attributable to the micro-machinery, not the ink. Moreover, the capabilities of various cartridge models vary drastically in terms of print speed, print quality, drop size and resolution, and yield so a comparison of those machines based upon the quantity of ink they contain is an apples to oranges comparison. And as explained below, such a comparison could well mislead consumers into buying cartridges that will cost them more, not less, per print. Treating these sophisticated machines as though they were mere containers for ink is inappropriate.

#### Ink Exemption

Ink is expressly exempt from labeling as provided by the U.S. Fair Packaging and Labeling Act. See 16 C.F.R. 50.3.2(a), attached hereto. The exemption for ink has been consistently observed and applied for decades by the State of Florida, as well as every other state in the union. This is clearly demonstrated by the fact that during this period literally billions of ink pens, markers and highlighters have been sold without any labeling whatsoever as to the quantity of ink these devices contain. It cannot plausibly be denied that during the nearly 40 years the exemption has been in effect, enforcement officials of the Bureau have personally purchased a multitude of such

products and cannot possibly have failed to notice that none of them disclosed the quantity of ink.<sup>1</sup>

Yet it does not appear that the Florida or any other state is currently considering requiring labeling of pens, markers and highlighters even though there is no principled way to treat them more leniently than print cartridges. Were the Bureau to abruptly change its longstanding policy regarding the ink, it would constitute a watershed change in Florida law that would encompass the entirety of two large industries that for decades have reasonably believed they were exempt. Any such unannounced deviation from established policy would create significant due process issues for the writing implement and printer companies affected.

#### Labeling Would Cause Confusion

As mentioned during our brief conversation, contrary to the objective of permitting meaningful comparisons of products, labeling ink volume of printing devices is more likely to cause confusion and in many cases, could cause consumers to make perfectly incorrect decisions. The ratio of the amount of ink contained in a cartridge versus the amount of printed pages a cartridge can produce is markedly different among various cartridge models. For example, a cartridge model that ejects relatively large drops of ink will consume far more ink to produce a given print than one with very fine drops and, ironically, the quality of the fine drop print will be better. Thus a consumer who chooses large-drop technology cartridge because it contains more ink than an equally priced fine-drop technology cartridge, will actually end up be paying more for each print, and obtain poorer print quality to boot.

In contrast, page yield estimates can provide a meaningful comparison of value to a consumer, at least if all manufacturers employ the same estimating assumptions and techniques. In this regard, the International Standards Organization (ISO), an independent, worldwide standard-setting body which is also interested in promoting accurate comparisons by consumers, has rejected reliance on ink volume or quantity. Instead, ISO, after studying for years the specific issue of inkjet cartridge performance and the consumer's need for meaningful comparative information, has developed a yield estimating and claiming methodology that permits cartridges to be compared using a consistent yardstick. Unlike ink volume measurements, these page yield measurements provide consumers a reliable way to compare the relative amount of printing that can be expected from competitive models of printers and their associated cartridges.

#### Coleman's Newsletter Article

Last, I would like to address Mr. Coleman's March 2005 newsletter article. To be honest, I am not entirely certain what this document is intended to be, but a non-regulatory agency employee's opinion set forth in a newsletter cannot possibly have the effect of countermanding the official Federal Trade Commission regulations that establish the exemption for ink. That regulation has the full force and effect of law and is recognized by all other states. Mr. Coleman's newsletter article simply is not an authoritative document that could formulate the basis for the sweeping regulatory change that Dr. Ink seeks.

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<sup>1</sup> Inkjet print cartridges have similarly been sold for in every state at least 25 years.

Moreover, Mr. Coleman's article does not address the ink exemption discussed above. Nor does it consider or discuss the lengthy and uniform custom and practice by the Federal government and every state government relating to ink products. It does not address the matter of whether billions of pens, markers and highlighters must, as a direct consequence of his position, must also be labeled. In this regard, there is not a single reason Mr. Coleman cites in support of his opinion that does not apply with equal force to the billions of pen, marker and highlighter packages that also do not display liquid volumes.

Although during our brief conversation you mentioned that the high cost of inkjet cartridges distinguishes them from pens, there is absolutely no provision in any packaging laws or regulations that exempts inexpensive items or provides a higher level of regulation for more highly priced items. If anything, pens, markers and highlighters are dramatically closer to being mere bottles of ink (like milk cartons) than the sophisticated micro-machines that comprise inkjet cartridges. There simply is no conscionable way for the Bureau to require the marking of high-tech ink delivery devices while permitting low-tech ink delivery devices such as pens and markers (which are purchased by more consumers and far more often) continue to be unmarked.

#### Conclusion

Lexmark very much hopes that based on the foregoing, the Bureau will deny Dr. Ink's request. However, if the Bureau is inclined to change its policy of nearly four decades upon which at least two huge industries have relied in good faith, Lexmark hereby requests that it do so only after giving Lexmark and all other members of the both affected industries notice and a formal opportunity to be heard regarding the complex set of regulatory and compliance issues presented by the change desired by Dr. Ink.

Very truly yours,



Charles S. Krätzer  
Associate General Counsel

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TOC: Code of Federal Regulations > TITLE 16-- COMMERCIAL PRACTICES > CHAPTER I-- FEDERAL TRADE COMMISSION > SUBCHAPTER E-- RULES, REGULATIONS, STATEMENT OF GENERAL POLICY OR INTERPRETATION AND EXEMPTIONS UNDER THE FAIR PACKAGING AND LABELING ACT > PART 503-- STATEMENTS OF GENERAL POLICY OR INTERPRETATION > § 503.2 Status of specific items under the Fair Packaging and Labeling Act.  
Citation: 16 cfr 503.2

16 CFR 503.2

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\*\*\* THIS SECTION IS CURRENT THROUGH THE FEBRUARY 26, 2009 ISSUE OF \*\*\*  
\*\*\* THE FEDERAL REGISTER \*\*\*

TITLE 16 -- COMMERCIAL PRACTICES  
CHAPTER I -- FEDERAL TRADE COMMISSION  
SUBCHAPTER E -- RULES, REGULATIONS, STATEMENT OF GENERAL POLICY OR INTERPRETATION AND EXEMPTIONS UNDER THE FAIR  
PACKAGING AND LABELING ACT  
PART 503 -- STATEMENTS OF GENERAL POLICY OR INTERPRETATION

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16 CFR 503.2

§ 503.2 Status of specific items under the Fair Packaging and Labeling Act.

Recent questions submitted to the Commission concerning whether certain articles, products or commodities are included under the definition of the term "consumer commodity", as contained in section 10(a) of the Fair Packaging and Labeling Act, have been considered in the light of the Commission's interpretation of that term as set forth in § 503.5 of this part as follows:

(a) The Commission is of the opinion that the following commodities or classes of commodities are not "consumer commodities" within the meaning of the Act.

- Antifreeze.
- Artificial flowers and parts.
- Automotive accessories.
- Automotive chemical products.
- Automotive replacement parts.
- Bicycle tires and tubes.
- Books.
- Brushes (bristle, nylon, etc.).
- Brooms and mops.
- Cameras.
- Chinaware.
- Christmas light sets.
- Cigarette lighters.
- Clothespins (wooden, plastic).
- Compacts and mirrors.
- Diaries and calendars.
- Flower seeds.

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- Footwear.
  - Garden tools.
  - Gift ties and tapes.
  - Glasses and glassware.
  - Gloves (work type).
  - Greeting cards.
  - Hand tools.
  - Handicraft and sewing thread.
  - Hardware.
  - Household cooking utensils.
  - Inks. ←
  - Jewelry.
  - Luggage.
  - Magnetic recording tape.
  - Metal pails.
  - Motor oil (automobile).
  - Mouse and rat traps.
  - Musical instruments.
  - Paintings and wall plaques.
  - Photo albums.
  - Pictures.
  - Plastic table cloths, plastic placement and plastic shelf paper.
  - Rubber gloves (household).
  - Safety flares.
  - Safety pins.
  - School supplies.
  - Sewing accessories.
  - Silverware, stainless steelware and pewterware.
  - Small arms ammunition.
  - Smoking pipes.
  - Souvenirs.
  - Sporting goods.
  - Toys.
  - Typewriter ribbons.
  - Woodenware.
- (b) The Commission is of the opinion that the following commodities or classes of commodities are "consumer commodities" within the meaning of the Act:
- Adhesives and sealants.
  - Aluminum foil cooking utensils.

**(Position Provided by NIST WMD February 2005)**

Due to the discussion of inkjet cartridges, over the NIST W&M list server, WMD has investigated this situation. WMD concludes that inkjet cartridges need a net quantity statement in liquid measure to comply with Handbook 130 requirements. Our analysis is below and further discussion is welcomed.

**Inkjet and Printer Cartridge Considerations**

The model weights and measures law contains several relevant sections that apply to ink cartridges.

**Weights and Measures Law, Section 19. “Information Required on Packages:”**

Except as otherwise provided in this Act or by regulations promulgated pursuant thereto, any package, whether a random package or a standard package, kept for the purpose of sale, or offered or exposed for sale, shall bear on the outside of the package a definite, plain, and conspicuous declaration of:

- the identity of the commodity in the package;
- the quantity of contents in terms of weight, measure, or count;
- the name and place of business of the manufacturer, packer, or distributor, in the case of any package kept, offered, or exposed for sale, or sold in any other place other than on the premises where packed.

**Weights and Measures Law, Section 17. “Method of Sale:”**

The method of sale shall provide accurate and adequate quantity information that permits the buyer to make price and quantity comparisons, except as provided by established trade custom and practice. While trade custom and practice is a consideration in some instances... the burden to provide “accurate quantity information” by means of a designated “method of sale” is the responsibility of the manufacturer.

Count alone does not fulfill this requirement.

A declaration of quantity in terms of count shall be combined with appropriate declarations of the weight, measure, and size of the individual units unless a declaration of count is fully informative.

**Packaging and Labeling Regulation, Section 6.4. – “Terms:”** If there exists a firmly established general consumer usage and trade custom with respect to the terms used in expressing a declaration of quantity of a particular commodity, such declaration of quantity may be expressed in its traditional terms, provided such traditional declaration gives accurate and adequate information as to the quantity of the commodity. Any net content statement that does not permit price and quantity comparisons is forbidden.

**Weights and Measures Law, Section 15. – “Misrepresentation of Quantity:”** No person shall represent the quantity in any manner calculated or tending to mislead or in any way deceive another person. If “accurate quantity information” is not provided, consumers are certainly being misled or deceived and cannot possibly make price and quantity comparisons.

The Federal Trade Commission (FTC) has informed us that the following commodities (partial list only - similar products) are excluded from FTC jurisdiction.

- Ink
- Fountain Pens
- Kindred Products (ball point pens, lead pencils, lead refills, etc.)
- School Supplies
- Stationery and Writing Supplies
- Typewriter Ribbon
- Printer Cartridges\*

\*While printer cartridges are not listed specifically in Handbook 130, FTC has indicated to NIST that commodities of this nature do not fall under their jurisdiction.

**Metric “Only” Labeling:**

Since the labeling of printer ink cartridges fall under state labeling regulations, dual unit labeling is not required. Hence, these packages may be labeled in only metric units.

**Packaging and Labeling Regulation, Section 11.33. “Inch-Pound Units, Exceptions – Consumer Commodities:”**

The requirements for statements of quantity in inch-pound units shall not apply to packages that bear appropriate International System of Units (SI). This exception does not apply to foods, drugs, or cosmetics or to packages subject to regulation by the FTC, meat and poultry products subject to the Federal Meat or Poultry Products Inspection Acts, and tobacco or tobacco products.

**NIST Handbook 133, “Checking the Net Content of Packaged Goods,” Fourth Edition, January 2005 – Product Testing:**

NIST Handbook 133 has been prepared as a procedural guide for compliance testing of net content statements on packaged goods. The gravimetric test method (outlined in Chapter 2) uses weight measurement to determine the net quantity of contents of packaged goods. The handbook provides general test methods to determine the net quantity of contents of packages labeled in terms of weight and special test methods for packages labeled in terms of fluid measure or count. Gravimetric testing is the preferred method of test for products, such as inkjet and other types of printer cartridges. Therefore, the test method to verify the net contents of ink in printer cartridges exists. However, NIST recognizes the difficulties associated with determining the net content of these cartridges, such as, density determination, product cost, tare verification (cartridge), the cleaning of tare and standards, and finally, inspection lot size. Unless the products are checked at the plant or warehouse, it may be difficult to find a sufficient “retail” lot, adequate in size to obtain an appropriate sample.

**G.J. Neville**

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January 21, 2010

Attn: Mr. Don Onwiler, Executive Director  
National Committee on Weights and Measures  
1135- "M" Street, Ste. 110  
Lincoln, NE 68508

Sent by E-mail: info@ncwm.net

**Re: Citizen comment on  
270-9 HB 130- Uniform Regulation for Method of Sale  
of Commodities—Packaged Ink and Toner  
Cartridges**

Dear Mr. Onwiler:

On 01-19-10 I spoke with Ms. Lisa Warfield this morning and she directed me to certain print sources pertaining to the upcoming NCWM meetings, including the subject of Packaged Printer Ink and Toner Cartridges. Furthermore, she recommended I might speak with Mr. Ed Williams in Sacramento regarding these anecdotal experiences and observations.

I then spoke with Mr. Williams and he felt I should direct the following commentary to you for possible inclusion as citizen input in your upcoming committee meeting report.

I don't do this much and I have a propensity for HOT AIR...hope this isn't too bad.

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After having done my homework by reading Publication #15, Item 270-9, I shall first respond to certain comments made in Lexmark's Fox in the Henhouse letter to Mr. Max Gray, dated, March 17, 2009 supporting the current ISO-developed standard for Toner-Ink measurement methodology; then offer a personal experience to illustrate the current standard's shortcomings; then a few observations and unsolicited recommendations; and lastly, a closing comment on the need for furthering a new design paradigm and how your NCWM Conference can do something about it!

**Item 1** -- It is irrelevant that the Ink/Toner component is a small part of the overall cost of a new or replacement cartridge—what matters is that the ink/Toner requires a costly and complex cartridge container for delivery. THEY ACT AS A UNIT! Lexmark's implication that the relatively low cost of the Ink/Toner alone renders proper regulatory scrutiny unnecessary is totally spurious.

In fact, the opposite is true—the Ink/Toner and Cartridge combination is an EXTREMELY EXPENSIVE Ink/Toner Delivery System because Content and Container act as a unit which, furthermore, is uniquely designed (with certain patent protection) to fit the corresponding printer model(s). Whether an OEM or lower-priced Name Brand cartridge, the Unit is surprisingly expensive!

**Items 2, 3** --Re standards for Page Yield and current ISO solutions—"yield estimating and claiming methodology that permits cartridges to be compared using a consistent yardstick":

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My layman's opinion is that the "consistent yardstick" approach alone is inadequate. It prevents quantification of the contents—the essential ingredient inside the cartridge. Why not require the OEM Ink/Toner Cartridge/Printer industry to comply with freshly conceived DESIGN CRITERIA with at least one goal being to provide the consumer with a simple, yet accurate "back-up indicator" of a cartridge's actual toner content?

### **Personal observations:**

The purpose of the foregoing recommendation would be to empower the consumer with a GUARANTEE for DELIVERY of the ENTIRETY of the purchased Ink/Toner.

This approach is meant only to supplement, not replace, the simpler, more convenient ISO-approved Page Count approach. The secondary consumer benefit would be to eliminate the "wobble room"-based dealer responses to Ink/Toner shortage customer complaints as not many consumers are inclined to pry toner cartridges apart or properly argue issues of equity in the event of suspected shortages.

Whether by software revisions or hardware re-design, mandated new performance-based criteria can provide the consumer with a long-overdue checks-and-balances Tool to level the manufacturers' playing fields.

Solutions can take many forms—whether alpha- numerics via existing LCD windows or by color bar chart display graphics or even by adoption of primitive "clear plastic" toner cartridges. At the very least, the consumer would then have some kind of needed VERIFICATION TOOL.

Naturally, Lexmark's letter to Mr. Gray fails to address any constructive new solutions as none were previously required by any regulatory agency. To illustrate the need for the foregoing, consider my particular frustration which occurred because of the absence of a Verification Tool:

### **My personal experience (Haven't we all had them?):**

The following sequence occurred in my design office. We purchase Brother or Staples TN-350 Toner Cartridges for my Brother MFC 7420 desktop laser printer (purchased several years ago), which has generally been lightly used (average 3-15 copies daily) since purchase:

#### **EVENTS IN MY OFFICE:**

- Periodically, the printer shuts down and will not print any longer...until a replacement Toner Cartridge is purchased and inserted into the printer!  
*NOTE:*
  - No easily noticeable, if any, Print Counter capability on the cartridge or the printer. The Toner Cartridge is a proverbial "Black Box".
  - Printer shutdown appears to occur SIGNIFICANTLY BEFORE the estimated 2500 pages of usage.
  - No warning whatsoever of the pending total shutdown, i.e. printing quality drop-off or fade-out.
  - All printed copies 100% perfect prior to shutdown.
- Printer LCD Display Message then appears, saying something like "Out of Toner" or "Replace Toner Cartridge"

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- Printer cannot be cajoled into operating again without a new replacement cartridge, i.e. pushing the rocker switch to OFF, waiting 30 seconds, then back to ON; rocking toner cartridge; sliding the corona wire; etc.

### EVENTS FOLLOWING AT THE STORE:

- I take “suspect” cartridge to office supply dealer (where I purchased the printer, cartridges and all office supplies). A question and complaint is planned prior to purchasing a new replacement cartridge.
- The Store Manager recites the manufacturer’s mantra about the difficulty of estimating toner consumption, varying printed text/page densities, etc.
- I then suggest we investigate the circumstances together—we remove End Cap from cartridge and....guess what....a SIGNIFICANT amount of toner spills out!
- The Store Manager then claims “Equipment Malfunction” may be responsible—did I purchase a Warranty? Ultimately, he reluctantly offered me a new replacement cartridge at half-price—but it was like pulling teeth from a donkey!.

### EPILOGUE:

Was I satisfied? Yes and No

- Yes, because of the Manager’s offer--I didn’t feel like a total idiot.
- No, because of the repair disruption and the waste of my time.
- No, because of my uncertainty of a future repeat experience.
- No, because of the lack of final problem resolution—was the printer the real culprit or was it a batch of poorly designed Ink/Toner cartridges? Without the benefit of a built-in Diagnostic or Verification Tool(s)--either answer might be wrong. Will I, in the future, prematurely purchase again one or both of this manufacturer’s products?

To avoid that risk of becoming a true idiot (the second time burn), will I switch manufacturers to avoid that possibility?

- Probably yes. What a shame, because otherwise, the printer offers excellent value!

### Final Thoughts/Conclusions:

The cartridge Page Yield Estimate, purportedly reflecting quantity of content, provides inadequate consumer protection without at least one additional design feature (in mechanism or software) to deliver to, and assure, consumer of **full usage** of the cartridge’s Ink/Toner contents.

Should not better Consumers Protection apply to the design of COMPLEX or PERMANENTLY SEALED CONTAINERS (i.e. Ink/Toner Cartridges)? These devices, during design, should trigger **design compliance with additional new standards and regulations**, generated by the appropriate agency, to assure the customer of:

1. Quantity of container’s Contents
2. Delivery of Entirety of Contents, as is practical.
3. Provide consumer with a Print Count or Ink/Toner quantity verification tool, (on Cartridge or Printer Display Screen) as offered in larger printers.

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**WHICH COMPARISON IS MORE APT?**

Consider the comparison of a sophisticated, complex, injection-molded Ink/Toner Cartridge vs. an old-fashioned Burlap Bag for Grain or Paper Bag for Cement, where measurement can be easily confirmed because of the container's scale, flexibility and negligible weight --after all, it's just a BAG!

Now consider the same Toner Cartridge vs. a craftily-designed rigid Magician's Box with a false bottom (designed by the Magician or Manufacturer), which by accident or design, conceals a portion (i.e.30%) of the grain--which remains unused and ultimately is then unknowingly discarded by the Consumer. Is that right?

**Throughout history, did not the science of measurements ultimately evolve in most every society so as to identify and prevent the proliferation of deceptive and/or irregular measurement practices (whether for government tax gain or for the public's protection)?**

**So Why Not Now?**

**EXAMPLE OF THE NEW PARADIGM--REFILL THE REFILL:**

The job of providing "replacement toner" could be done just as well with a Refill-the-Refill design. An affordable, small, lightweight, saltshaker-sized, two-ounce \$3.00 Ink/Toner refill snap-on module or squeeze-dispenser bottle enabling a customer to conveniently refill an empty toner cartridge (purchased in \$18.00 six-packs instead of buying one \$50.00 traditional cartridge on six separate trip occasions). When do we "outlaw" UNAFFORDABLE, LARGE, HEAVY, PACKAGED, PALLETED and TRANSPORTED cartridges produced and sold in the usual way?

A side-by-side Energy Audit of the two approaches would indicate at least NINE BILLION DOLLARS OF WASTE and FAR MORE IN UNNECESSARY ENERGY COSTS in the ten billion dollars per year Ink/Toner Cartridge Industry. Did I read ten billion somewhere?

In closing, the Ink/Toner cartridge is only one of countless ethically-challenged manufactured products cluttering and consuming our environment. My experience, though very minor in the big scheme of things, again illustrates the range of social and environmental losses resulting from the current license manufacturers often have to legally harvest unearned profits and waste substantial energy in the process of producing these small-scale consumer products. The public suffers.

Respectfully,

Gary J. Neville

cc: Lisa Warfield,  
Ed Williams



**Information Technology Industry Council**  
Leading Policy for the Innovation Economy

## **Printer Toner and Ink Cartridges:**

### **Best Practices for Conveying Yield Performance to the consumer**

This paper has been prepared by the Information Technology Industry Council (ITI). ITI is the premier voice, advocate, and thought leader for the information and communications technology (ICT) industry. ITI is widely recognized as the tech industry's most effective advocacy organization in Washington D.C., and in various foreign capitals around the world. ITI's members include the leaders of printer manufacturing technologies including Epson, Hewlett Packard, Kodak, and Lexmark, among others.

#### Executive Summary:

The ultimate goal of any product measure is to provide information to a customer that facilitates an informed purchase decision. At first glance, comparing the volume or weight of ink or toner would seem to be a good proxy for the page yield. For a host of reasons this is often not the case. Toner and ink cartridges are complex mechanisms designed to deliver a consistent customer experience and because of this, ink or toner can be used in different amounts when printing and for purposes other than printing. All of this is highly dependent on the design of the larger printing system of which the cartridge is a critical but not independent part.

The printing industry realized the difficulty of presenting cartridge performance information to the customer and because of this voluntarily chose to develop several standards for measuring yield performance. These standards are developed specifically for these devices and use standard test patterns and methods to provide accurate and repeatable measurement. Moreover, the standards include protocols for clear and consistent communications to users regarding cartridge yields. The industry wholly believes that these test procedures provide a more reliable means of measurement and a more accurate method for consumers to determine value than comparing the volume or weight of ink or toner.

## **Printer Toner and Ink Cartridges:**

### **Best Practices for Conveying Yield Performance to the consumer**

Objectives of weights and measures regulations include facilitating value comparisons and providing a standard of fairness in the marketplace. When it comes to selecting printer hardware and replacement supplies, these objectives dictate that weights and measures criteria that could lead the consumer to making economically incorrect decisions regarding value should not be implemented.

Some customers are interested in making comparisons on the relative value between printing supplies, both at the initial printer purchase and afterwards when purchasing additional supplies. In addition to cost, product reliability, brand reputation and print quality another important measure considered by some customers during the supply purchase is page yield. At first glance, comparing the volume or weight of ink or toner would seem to be a good proxy for the page yield. Unfortunately this is often not the case. This paper will outline the drawbacks of using weight or volume as a proxy for page yield and highlight the reasons why all major printer manufacturers use a set of ISO/IEC standards to measure and communicate printer yield.

Depending on the printing technology, the use of ink or toner can be impacted by several factors.

The amount of toner applied in printing pages compared to the amount of toner supplied in the cartridge is dependent on many factors and that a simple measure of the weight of the toner will not give a clear indication of ultimately how many pages can be printed. In electro-photographic (laser) printers, different toner formulations will use different amounts of toner when printing the same page. This is due to charge, particle size and formulation variation between toners. These attributes are engineered and varied by each cartridge vendor to provide what they feel to be the best experience to their customers. Some customers prefer thin sharp lines and fine detail, others prefer thick bold lines. Depending on the choices that a given manufacturer makes in toner formulation (base polymer, particle size, charge distribution and charge control agents), the amount of toner used to print the same page may vary. Additionally, the amount of toner cleaned and deposited in the waste hopper depends on several variables including the job size, coverage environment and printer design. Finally, the bulk densities of toners are not the same; for a given volume of toner, there can be significant differences in weights. All of these factors result in the reality that two different toner supplies of the same weight will not necessarily deliver the same number of pages.

Similar to laser printers, inkjet printer cartridge vendors manipulate several variables in their ink formulation to meet the needs they identify as important for their customers. Some of the variables that manufacturers consider and apply include: different ink formulations; dye vs. pigment inks, actual loads of pigment or dye in the ink formulation, and drop size. Different combinations of these ink content characteristics will result in substantially different ink consumption rates while printing the

same page. In addition, all inkjet systems perform routine servicing, and those servicing routines may be driven by a number of factors such as the ink formulation, usage and content. In addition, changes to non-ink materials by the inkjet cartridge manufacturers or during remanufacture can affect the amount of ink that can be used in printing pages. Finally, for the same volume of ink, two different systems or the same model cartridge from two different vendors can print a different number of pages.

Ultimately what matters to many customers is answering the question, “How much can I print with a cartridge in a given printer?” Page yield reported using the ISO/IEC methodology better addresses this question than weight or volume. ISO/IEC JTC1 SC28 identified this as a consumer need in 2000 and started working on a family of standards that address this customer need. Standards now published measure yield for monochrome laser printers (ISO/IEC 19752), color laser and color inkjet printers (ISO/IEC 19798 & ISO/IEC 24711) using a common test suite (ISO/IEC 24712). Currently under development are standards to measure photo yield consisting of a methodology for inkjet printers (ISO/IEC 29102) and a photo test suite for any printing technology (ISO/IEC 29103). These standards are based on common design philosophies and change their methods slightly, depending on the technology being measured. The following attributes are endemic to each standard:

1. Use of a well defined consumer type document for printing – Coverage can vary depending on how it is measured and depending on what choices are made in defining coverage; the same “coverage” page can perform differently. For the ISO/IEC standards, the test pages were defined so that a consumer can more easily relate them to their work stream. These pages are freely available so customers can view and understand what the standard is based on. These test pages can be found at [www.iso.org/jtc1/sc28](http://www.iso.org/jtc1/sc28).
2. Testing of multiple printers and cartridges to account for printer and supply variation – There is manufacturing variation not only with how much ink or toner is put in a supply, but how effectively a printing system uses that ink or toner. This usage is also impacted by the specific printer used during test; some printers of the same model will use more or less ink or toner. For this reason, the ISO/IEC standards require a minimum of three cartridges to be used on a minimum of three printers (minimum of 9 cartridges tested). The yield information from these 9 cartridges is reported using a lower 90% confidence bound (LCB) on the mean. This gives a reliable estimate of lowest predicted average yield with 95% statistical confidence. The LCB not only takes into account the average performance of the cartridges tested, but also the breadth of variation in the cartridges and printers tested. The goal is to try and characterize the end user experience taking into account some of the normal variations in printers and supplies.
3. A well controlled printing environment – The environment that a printing system operates in can have an impact on the number of pages printed for a given amount of ink or toner. For laser systems both temperature and humidity can impact the amount of toner used. For this reason both the temperature and humidity are controlled for toner yield testing. For inkjet,

temperature is the main environmental driver for ink usage, so only temperature is controlled during testing.

4. A well defined end of life criteria – For the purposes of the ISO standards, end of life is defined in one of two ways. First, when the printer stops printing and reports that the supply should be changed. The other method requires a visual assessment of elements on the test targets. This visual assessment is defined as a visually significant fade in the target elements greater than 3mm as compared to the 100<sup>th</sup> print for that cartridge. These two methods are meant to represent the two common criteria that users would choose to determine if a supply has to be changed.

When the publication of the first yield standard occurred in the summer of 2004 it was accepted by industry and consumer's groups as the best method for conveying one attribute of cartridge performance that was of interest to customers. Building on this acceptance, ISO/IEC JTC1 SC28 created additional standards for yield; these have been met with similar market acceptance as the original.

Because well established methods for the measure of cartridge yield exist and weight and volume are not as useful or meaningful in making value comparisons, this group recommends that cartridge performance information be conveyed to customers using the developed ISO/IEC yield standards.

Footnotes to press releases and reception of ISO yield standards:

<http://www.pcmag.com/article2/0,2817,2183959,00.asp>

<http://www.hp.com/hpinfo/newsroom/press/2004/040617b.html>

<http://www.incits.org/press/2007/pr200701.pdf>



**Information Technology Industry Council**  
Leading Policy for the Innovation Economy

August 10, 2010

Mr. Don Onwiler, Executive Director  
National Committee on Weights and Measures  
1135- "M" Street, Ste. 110  
Lincoln, NE 68508

Via Email

**Subject: NCWM Proposal for Uniform Regulation for Method of Sale of Commodities-  
Packaged Printer Ink and Copier Toner**

Mr. Onwiler,

On behalf of the Information Technology Industry Council (ITI) and its members<sup>1</sup>, I welcome the opportunity to offer these comments on the issue above for consideration at the 2010 National Conference on Weights and Measures (NCWM) Annual Meeting.

ITI agrees with the main objective of this proposal which is to provide consumers with a meaningful measurement of value. In this case, the most relevant measurement criterion for consumers is the number of pages that they can obtain from a given printer cartridge. The ISO/IEC standards for yield provide a common, well accepted basis for consumers to understand and compare different cartridge options.

However, ITI's members believe that volume and weight are a poor proxy for value. This measurement does not directly relate to the number of pages that a consumer can print from a cartridge and its use may lead consumers to draw incorrect conclusions regarding their choice of supplies.

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<sup>1</sup> 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 including Epson, Hewlett Packard, Kodak, and Lexmark, among others.

We continue to support the use of ISO/IEC yield measurement standards, which provide a clear, managed basis to measure and declare the yield of a specific cartridge. These standards rely on a test suite of pages relevant to consumer output that are freely available to consumers to review.

For color inkjet and laser printers, the industry supports yield declarations based on the normative testing described in ISO/IEC 24711 and ISO/IEC 19798. For monochrome laser printers, the industry supports yield declarations based on the normative testing described in ISO/IEC 19752. These three ISO/IEC measurement methods are widely accepted and are in practice by the industry. ITI would not encourage the use of any other value measurement as part of a mandatory or supplemental labeling requirement.

Thank you for your consideration of these comments. We recognize that this is a complex issue and look forward to continuing to work with the NCWM and with the working group being created under the L&R Committee. Please let me know if you have any questions or require further information.

Sincerely,



Josh Rosenberg  
Director, Global Policy

cc:

John Gaccione  
Chairman  
Laws and Regulations Committee  
National Committee on Weights and Measures

Lisa Warfield  
NIST Technical Advisor  
Laws and Regulations Committee  
National Committee on Weights and Measures



**Information Technology Industry Council**  
Leading Policy for the Innovation Economy

August 10, 2011

Ms. Maureen Henzler  
Chair, Task Group on Printer  
Ink and Cartridges  
<Via email>

Dear Ms. Henzler:

On behalf of the Information Technology Industry Council (ITI) and participating industry members, I would like to take this opportunity to share additional comments on the NCWM proposal before Laws & Regulations Committee's Task Group on Printer Ink and Toner Cartridges ("the TG"). We appreciate the opportunity to participate in the 96th Annual Meeting and to share our presentation with the TG concerning products, technologies, consumer value, and the ISO/IEC standards related to the proposal. We regret that there was insufficient time to provide our entire presentation, nor time for the TG to fully discuss the complex issues raised by the presentation. A copy of the presentation is attached along with additional comments that will both be submitted for inclusion in the NCWM Publication 16. We look forward to continuing to inform and support the TG's efforts.

The participating industry members viewed the TG session in Montana to be very productive. At the same time, it is clear that a great deal of work remains. To facilitate the process moving forward, we recommend that all interested parties reflect on the content shared to-date and frame questions, observations, and the like, to be shared with the group in advance of our next meeting. We would also suggest that it might be helpful for the Chair to circulate a "work plan" to identify all steps necessary to reach a satisfactory outcome for the TG process. This should be shared with all participants for feedback. A work plan might also help avoid any further misunderstanding or miscommunication concerning expectations of participants.

This miscommunication was evident at the TG meeting in Montana, when there were several comments indicating that a proposal was expected as part of industry's presentation. We were unaware that any of the TG participants were asked or expected to develop a proposal. To our knowledge, the only proposal pending comes from the Southern Weight and Measures Association and mandates the provision of weight and volume measurements on inkjet and toner cartridges. Our presentation in Montana addressed (as time allowed) questions circulated by the Chair to task group members at the 2011 Interim meeting and detailed the reasons for our opposition to this proposal. Our presentation also outlined the general reasons why we believe that the application of page yield based on relevant ISO/IEC standards might better achieve the current proposal's objective to clarify the labeling requirements for industry, consumers and weights and measures officials.

It is our hope that a full discussion of the issues, including resolution of the many questions and concerns highlighted in the attached, will help the TG progress toward a resolution acceptable to all stakeholders. To that end, we make the following recommendations:

- **Poll all stakeholders to identify missing or incomplete information.** We have highlighted several items in the addendum to this letter. It would be helpful for state regulators and other TG members to identify any outstanding technical or other information that industry could begin working to develop and provide.
- **Provide further input on how best to communicate efficiently and effectively on these complex issues.** We appreciate the suggestion that industry representatives attend the upcoming NCWM regional meetings and hold further discussion on this issue. However, considering the early stage of our exploration of the issues involved and the need for additional guidance from the TG (as noted above), we question how effective it would be to attend such meetings at this time
- **Have the TG jointly develop a formal written request to the FTC seeking legal determination as to the scope of the “ink” exemption under the FPLA.** Resolution of how federal law applies to the labeling of cartridges is central to what, if any, action is considered by the NCWM.
- **Compile all consumer complaints submitted to weights and measures jurisdictions that would be helpful in determining the scope and nature of the problem being addressed by the proposal before the TG.** Such data will help the participating industry members to better understand the consumer complaints that brought this issue before NCWM and evaluate possible solutions.
- **Provide further detail of the intended end-point of this process.** Will a final report be submitted to the Laws & Regulations Committee? Will all stakeholders be able to review a draft report before it is finalized and sent to the L&R Committee? Is the goal to reach consensus? If not, or consensus is not reached, what is the goal? How have other working groups addressed these issues?

We appreciate the thoughtful dialogue advanced by the Task Group and look forward to your reply regarding the next steps in the process.

Sincerely,



Josh Rosenberg  
Director, Global Policy



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## **Addendum**

### **Additional Considerations for the NCWM Task Group on Printer Ink and Cartridges**

The Information Technology Industry Council (ITI) and participating industry members would like to submit the following comments to the NCWM Task Group on Printer Ink and Cartridges (hereafter, “TG”). This addendum to our August 10, 2011 letter to Ms. Maureen Henzler, Chair of the TG, highlights our views on several key issues, and identifies those that we believe warrant further work by the TG on the proposal currently before the group as an Informational Item.

#### **FPLA Exemption**

As mentioned in previous NCWM conferences, Participating Industry Members believe that the scope of the proposal conflicts with labeling exceptions established under the Fair Packaging and Labeling Act (FPLA).<sup>1</sup> Although the regulation does not specify the reason for the express exemptions adopted by the Federal Trade Commission (FTC), we believe the exemption is appropriate to apply to printer ink and toners and that this legal threshold issue must be directly addressed and resolved before the matter is taken up by the Laws & Regulations Committee.

#### **Cartridge Technology Requires Special Consideration**

The Participating Industry Members share the goals of NCWM as expressed in Handbook 130 (the Uniform Weights and Measures Law) to provide accurate and adequate information on packages “so that purchasers can make price and quantity comparisons.” The wide spectrum of products and measures in Handbook 130 reflect the non-uniform nature of consumer products. In each instance, one should look to the nature of the product, use, and other variables to determine the method of sale that provides “accurate and adequate quantity information that permits the buyer to make price and quantity comparisons.” (Uniform Law).

The value of a printer cartridge sold is determined by several inter-related factors. These sophisticated attributes in combination determine the quantity and quality of output from a cartridge. Establishing a method of sale for printer ink and toner cartridges must account for the unique attributes of how these products are purchased and used. These factors include: (1) use of software and hardware technologies that are found in the cartridge; (2) the physical attributes of the ink/toner that vary (e.g., quality of third-party refillers may differ, affecting the

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<sup>1</sup> 16 C.F.R. §503.2.

value of a replacement cartridge); and, (3) the interplay between the cartridge and the printer. Put simply, the price/value comparison is only possible when the measure employed takes account of the interplay of these many factors. Based on common industry practice and consumer acceptability and use, yield is the only measure that allows for meaningful comparison. The value of a cartridge is measured by the printer's output. The filled cartridge has no value or utility standing alone.

Framing this issue in terms of weight or volume verification obscures the role of the physical cartridge and components in determining the value the customer receives. Checking the net quantity of commodities is a relatively straight-forward exercise for the inspector. The declared net quantity of contents of typical consumer commodities is the measured value by which consumers can make informed purchasing decisions. That is not the case for cartridges that dispense ink or toner as part of an integrated printer system. They are pieces of a complex sub-system used in a complex machine. It would be inaccurate to compare ink or toner as a commodity comparable to paper towels, as was suggested at the recent meeting. Paper towels are not an integrated, technology-driven system for an output, in contrast to printer cartridges that cannot be utilized without the necessary printer technology.

Contrary to typical consumer commodities where value is relative to package fill, increasing the contents of an ink cartridge does not necessarily drive a gain in value. Filling or refilling a cartridge to the maximum capacity, for example, can cause a host of issues that may jeopardize the operation of the cartridge and/or printer. Similarly, not all of the filled ink is used or accessible. Completely emptying a cartridge can damage the print-heads and other sensitive electronic components. These are just a few examples of why measurement of ink would not directly correlate to the value of the cartridge.

We appreciate that weights and measures officials routinely measure products to confirm stated quantities of net content. This function is vital to ensure equity and fairness in the marketplace, whereby consumers can make value comparisons among like products. In this technology-laden category, however, measurement of ink or toner content is not the best way to account for the true value of the product purchased. The value to the consumer (and the price paid) is not simply a measure of ink or toner quantity. The technology incorporated into the cartridge, and the "integration" between the cartridge and the printer, comprise an important value not reflected by the amount or volume of ink/toner in a cartridge. 2

### **Method of Sale by Weight or Volume is Misleading**

The proposed regulation currently under consideration by NCWM requires manufacturers to mark net volume of ink or net weight of toner on cartridge packaging. During the TG meeting at

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2 The Introduction to Handbook 130 notes among the purposes of the Uniform Laws and Regulations "to provide uniform and sufficient protection to all consumers in commercial weights and measures practices." When and how this authority is applied must involve careful consideration of the product and the manner of use.

the 2011 NCWM Annual Meeting, Industry Member Participants provided several illustrations of the potential issues with labeled net volume/net weight:

- The amount of ink or toner used by various printer models or brands can vary greatly due to the design features of the relevant printers. Printers often do not empty all material from cartridges due to various design and quality requirements.
- Differences in the designs of the cartridges intended for use with the same printer model or the condition (e.g., wear/tear) of the cartridges intended for use with the same printer model can affect the manner and amount of ink or toner used by the printer.
- The attributes of different inks/toners can cause the same printer to use ink or toner at different rates.
- The cost and value of the cartridge is not captured by a simple measurement of ink volume or toner weight.

#### **Developing Appropriate, Validated Testing Methodology**

Adopting a labeling requirement (as proposed to the Conference) whereby fluid ink is sold by volume (for each cartridge) or by net weight for toner would leave open a significant issue - - the development of an appropriate testing method by which an inspector would verify the declared net content. The Laws & Regulations Committee has confirmed the need for a test procedure for verification of net content developed for ink and toner cartridges, per the Publication 16 summary of the 2010 Interim Meeting held in Nashville. If the TG moves to advance the proposal for labeling for weight/volume, we would strongly support this L&R position.

The Industry Member Participants urge the TG to devote sufficient time to consider this issue. A reliable, validated method must accompany any new labeling requirement. Handbook 133, of course, is replete with reliable, validated methods for ensuring compliance with a statement of net quantity of contents. Cartridges are not simply containers, and the contents cannot be 'poured out and measured' like flour or rice. Some element of mechanical extraction is required, and manufacturers must know the method and how it applies to their products in order to make a clear and reliable net content declaration. To do otherwise would cause great uncertainty in implementation for Industry and highly inconsistent results for regulators.

The TG analysis of testing methodology should also take account of the following variables.

- There are hundreds of different cartridge models available from participating industry members, along with numerous other manufacturers and third-party suppliers.
- Every few years, a significant number of new printer hardware and cartridge models are introduced. These models reflect the natural evolution of technology to meet the ever-changing needs of home and office print users.
- Seemingly alike cartridges designed for a particular system can have designs that vary widely.
- Consistent extraction may require special tools or equipment, and efforts should be made to standardize those requirements.
- Inks and toners used by manufacturers vary greatly in chemical composition. The materials require safe and responsible handling, including disposal of unused contents.

These and other challenges may not be insurmountable, but nevertheless are formidable and must be addressed in considering the usability of a test method. Any verification testing would have to be appropriate and validated for hundreds of different cartridges. To that end, we have identified several questions that the TG might discuss at our next session: (1) what approaches has NCWM taken when faced with different product configurations and other unique characteristics that would affect (i.e., require modification) of an inspection method?; (2) how has NCWM adapted a single test method to diverse variations in the product's underlying technology?; (3) what type of equipment would be necessary to conduct an inspection to verify weight or volume of an ink or toner cartridge and how would such estimated cost compare with the purchase and maintenance of other test fixtures used by jurisdictions?; (4) how would the inspector handle safety and disposal issues?; (5) How would industry and regulators handle new product designs that are introduced that do not fit established measurement methodologies?; and (6) would destructive testing be required or is there information manufacturers/sellers could furnish to the inspector (e.g., cartridge tare weight)? We expect there are many other related questions as well.

#### **Status of TG's Consideration of ISO/IEC Standards**

Due to time constraints, the TG did not receive the planned briefing by industry about the ISO/IEC standards for determining page yield. The Industry Member Participants appreciate the TG's interest in the methodology, as it was identified as a primary area for discussion at the meeting in Montana. Page yield presents an effective, established and meaningful way for consumers to make value comparisons among ink and toner replacement cartridges. The

ISO/IEC methodology provides an internationally accepted means for verification of page-yield values.

Accordingly, we would recommend that appropriate time be allotted at the next TG session to allow for a complete presentation of this methodology and discussion on the merits and drawbacks of this approach. The “Addendum Sheets to the Interim Report” of the L&R Committee notes: “Concerns were expressed that the ISO/IEC test procedure for yield is not a practical method of testing.” There was no explanation of these concerns nor were TG members able to respond. It is our understanding that the L&R Committee awaits a final report from the TG and that the question of ISO/IEC methodology and other key issues remain open to consideration.

We appreciate the perspective concerning this standard based approach and trust that the entire TG will have an opportunity to fully understand and discuss the merits and feasibility of this methodology. Further discussions will be particularly appropriate in conjunction with a discussion on development of a viable test method.

### **Making Appropriate Comparisons and Moving Forward**

From our perspective, the TG dialogue would be enhanced by an explanation as to precisely how weight or volume serves the consumer’s interest in making price and quantity comparisons among ink or toner cartridges. As explained, a cartridge’s value is comprised of its hardware and software. The cartridge is not merely a receptacle that houses fungible ink that can be purchased and used for any printer. Furthermore, one cannot make reliable assessments as to price and quantity comparisons by examining the cartridge alone. The cartridge is a component of an integrated system (i.e., the printer). The amount of ink is immaterial as its value is only realized via the measured output from the printer (i.e., yield). We are unaware of instances where NCWM has regulated a component part of a complex system that is analogous to the ink or toner cartridge used in a printer. If such examples exist, it would be helpful if they were brought before the TG for discussion. As briefly raised at the last TG session, a battery provides an apt illustration of a consumer product that is appropriately sold by count, the value of which is not captured by a statement of the electric charge held.

Cartridges are comparable to batteries in several important respects. First, the consumer buys the battery technology together with the available energy. In the case of a single use battery, the amount of charge is not labeled. Beyond count, the label identifies the type of battery which enables the consumer to select the appropriate size for the electronic product for which the battery will be used. For a rechargeable battery, its compatibility with identified electronic products is the pertinent information, not the amount of energy used to recharge the battery. Similarly, the content of an ink or toner cartridge is not the primary information by which consumers assess value.

Second, the content of the energy within the receptacle (the battery casing) is not accessible to the consumer. The content of the battery has no utility or value apart from its use or integration into the unit that requires the charge from the battery to produce the desired output of the system as a whole. NCWM does not require that the amount of electrical energy stored in a battery be declared on the label, nor has the conference adopted a method for measuring the amount of energy that can be used from the battery. Weights and measures inspectors have one simple way to verify the content of packaged batteries - - by count.

It is conceivable that one could develop a method for verifying the amount of electrical energy stored in a battery. However, the value of providing this labeling information is dubious as the useful output of the battery will depend on its use. The endless possible uses of the batteries would make labeling and verification of a consumer battery complex, expensive, and ultimately of little value to consumers who can make value comparisons based on count and their own experience with the battery based on the particular use for which the battery is purchased. Ink and toner cartridges are similar. No reliable method can account or verify the ink content, nor would such information be useful to consumers. It is the intrinsic nature of batteries and ink cartridges (as part of a complex product) that explain why a statement of weight or volume is unnecessary and impractical. Taking into account all of the above complexities, costs, and challenges associated with sale by weight or volume, “count” appears to be the only manageable and accurate means by which to label the net content of ink and toner cartridges.

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It is our hope that these additional considerations will help advance the TG dialogue to find a solution that meets the objectives of the proposal before the Group and is acceptable to all stakeholders.

Slide 1



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**Industry Presentation  
before the  
Task Group on Printer Ink and Toner Cartridges  
NCWM Annual Meeting  
July 17, 2011  
Missoula, MT**

Slide 2

**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



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Slide 3

## 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



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Slide 4

## 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?



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Slide 5

## 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.



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Slide 6

## 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



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Slide 7



Slide 8



Slide 9

## 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



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Slide 10

## Customer Comparisons

2 purchasing occasions for customer comparisons:

1. Initial printer purchase
2. Replacement print supply purchase



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Slide 11

### Customer Experience

Comparisons across technologies



	 <b>Inkjet</b>	 <b>Laser</b>	 <b>???</b>
<i>Measure</i>	15ml	200g	2 sticks
<i>Yield</i>	300 pages	2000 pages	700 pages
<i>Price</i>	\$18	\$65	\$22



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Slide 12

### Customer Experience

Comparisons within a manufacturer

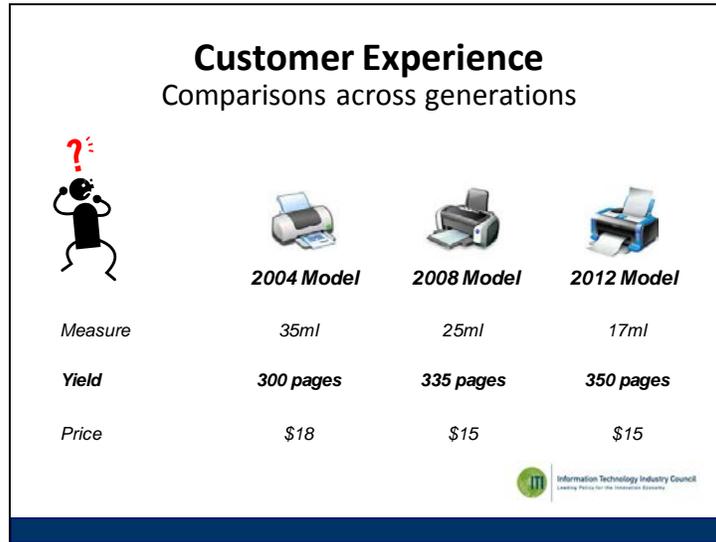


	 <b>Alpha 100</b>	 <b>Alpha 200</b>	 <b>Alpha 300</b>
<i>Measure</i>	65g	300g	960g
<i>Yield</i>	3000 pages	6000 pages	14,400 pages
<i>Price</i>	\$60	\$120	\$144

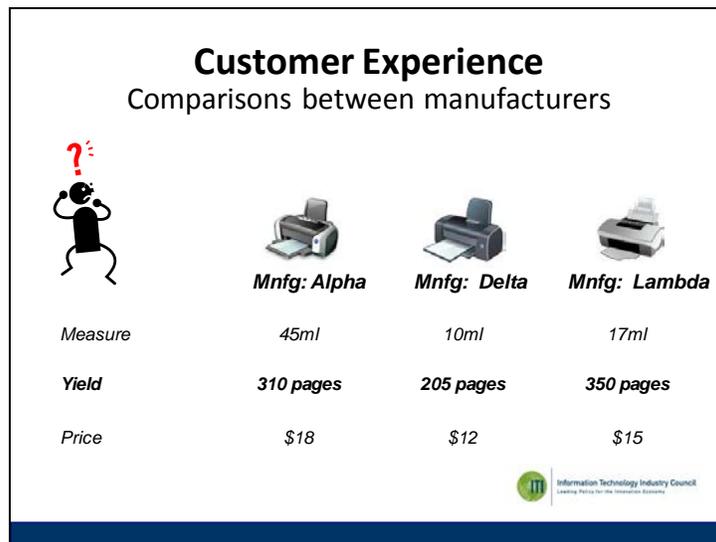


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Slide 13



Slide 14



Slide 15

### Customer Experience

Comparisons across cartridge suppliers



	 <b>Standard Black</b>	 <b>XL Black</b>
<i>Measure</i>	4ml	6ml
<i>Yield</i>	200 pages	600 pages
<i>Price</i>	\$15	\$30



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Slide 16

## Technical Factors



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Slide 17

### Technical Factors

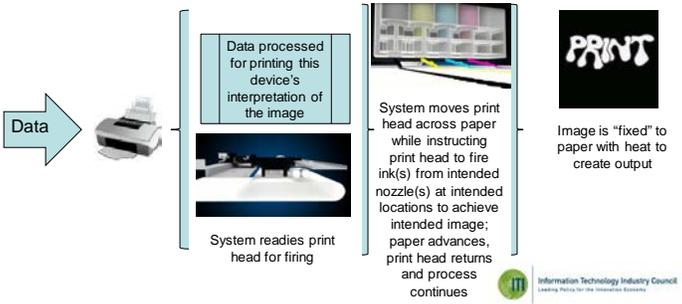
- In order to understand what information is important to the consumer and necessary to make price and quantity comparisons, there needs to be an understanding of the various printing technologies.
- The following technical discussion also highlight the challenges and drawbacks of requiring volume and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



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Slide 18

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



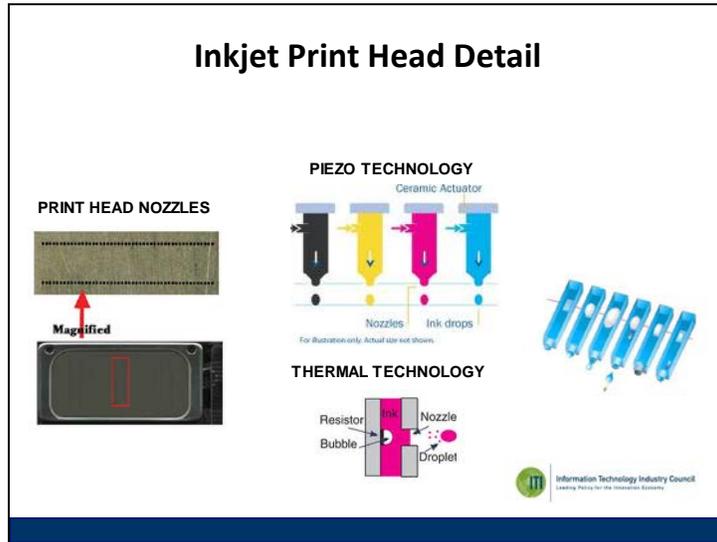
The diagram illustrates the simplified operation of an inkjet printer in four stages:

- Data Input:** An arrow labeled "Data" points to a printer icon.
- Data Processing:** A box contains the text "Data processed for printing this device's interpretation of the image". Below this is an image of the printer's internal print head mechanism with the caption "System readies print head for firing".
- Printing Process:** A box contains the text "System moves print head across paper while instructing print head to fire ink(s) from intended nozzle(s) at intended locations to achieve intended image; paper advances, print head returns and process continues". Above this is an image of a printer head moving across a sheet of paper.
- Output:** A box contains the text "Image is 'fixed' to paper with heat to create output". Above this is an image of the printed word "PRINT" on a black background.

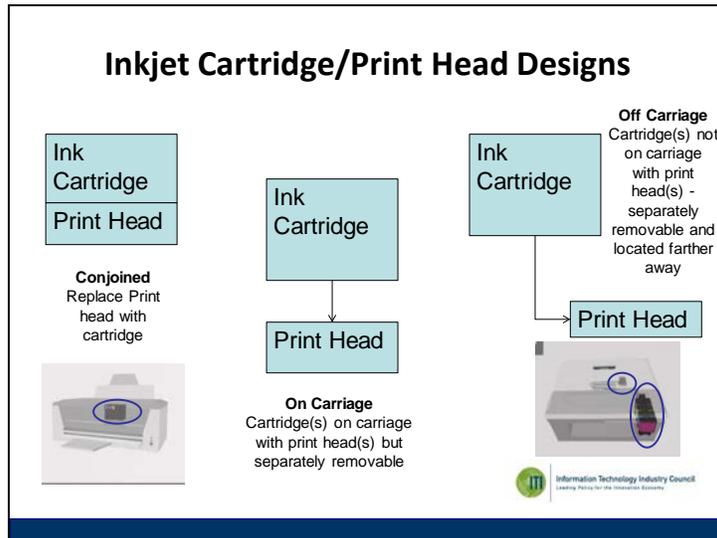


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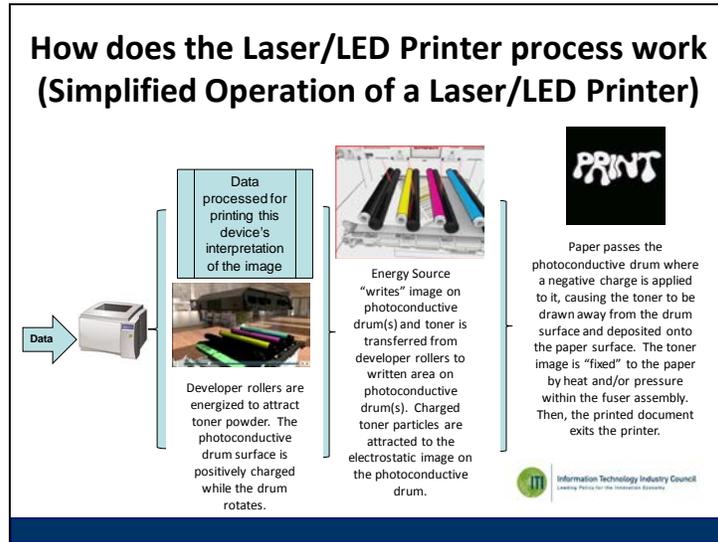
Slide 19



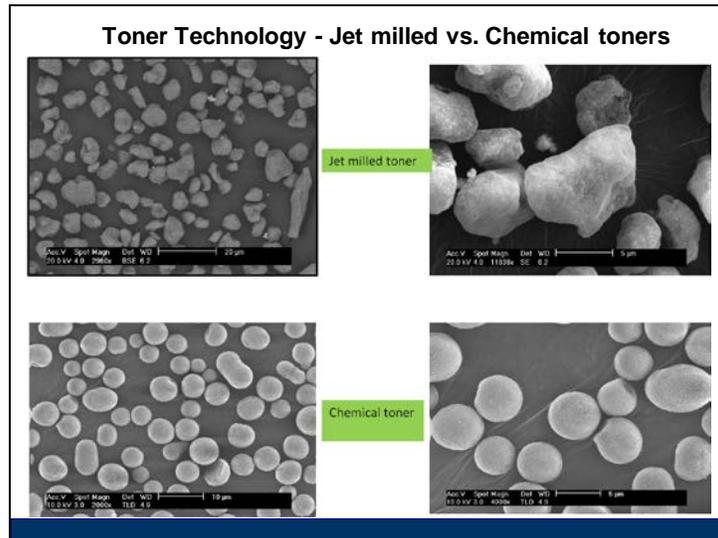
Slide 20



Slide 21

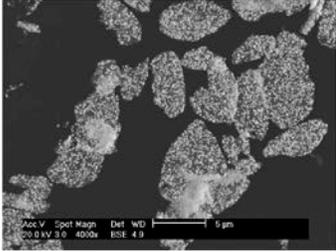


Slide 22

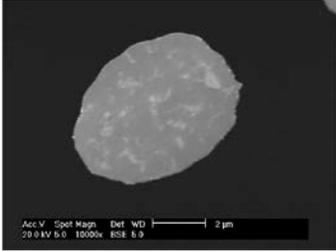


Slide 23

### Toner Density



Acc.V Spot Magn Det WD  
20.0 kV 5.0 4000x ESE 4.0  
5 µm



Acc.V Spot Magn Det WD  
20.0 kV 5.0 10000x ESE 5.0  
2 µm

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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Slide 24

### 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.uninetimaging.com/downloads/technical/TecArtWebAdded/Canon_LBP_EX_EP_E_Toner_Summit_Web.pdf)  
[http://www.collectingcanada.com/lbm\\_4019\\_29.pdf](http://www.collectingcanada.com/lbm_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/ITL\\_387640.html](http://www.priceless-inkjet.com/cartridge/ITL_387640.html)  
<http://www.iwt.kiev.ua/files/samsungml-1210.pdf>



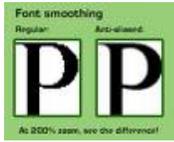
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### Inkjet and Laser/LED Technologies

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.



Font smoothing  
Regular      Anti-aliased  
As 100% zoom, see the difference!



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### 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.



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### 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.



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**Inkjet and Laser/LED Technologies**  
Summary of factors that may contribute  
to misleading volume or weight

<b>Inkjet</b>	<b>Laser/LED</b>
<ul style="list-style-type: none"><li>• Technology</li><li>• Print heads/drop weight</li><li>• Proprietary Ink Jet Nozzle Plate Designs</li><li>• Proprietary Ink Jetting Algorithms</li></ul>	<ul style="list-style-type: none"><li>• Developer rollers:</li><li>• Toner recapture vs. waste toner</li><li>• Proprietary Toner Algorithms:</li></ul>

**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



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**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



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### **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



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## 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.

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## Thank You

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