

Additional Position Papers

Item 232-4: *NIST Handbook 130*, Uniform Regulation for the Method of Sale Commodities

Section:
2.XX. Printer Ink and Toner Cartridges Labeling

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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.
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 100th 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>



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).¹ 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

¹ 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

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.

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.

(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.