The Value of Standardized Ink/Toner Yield Testing

A QualityLogic White Paper

Version 1.0

December 2007

5401 Tech Circle • Moorpark, CA 93021 • 805 531 9030
6148 N. Discovery Way, Ste. 175 • Boise, ID 83713 • 208 424 1905

Introduction

Manufacturers of printer products routinely publish specifications of "yield" for their printers' ink or toner cartridges. Yield specifications for these consumables are major components of customer comparisons of printer cost per page and total cost of ownership. Billions of dollars of printer and consumables sales are influenced by these simple specifications.

While quality and reliability play critical roles in customer satisfaction, printer buyers typically develop an economic analysis that depends on assumed ink or toner yield estimates to compare the competing printing solutions available to them.

How important are ink/toner yield specifications in the decision to purchase a printer? The cost of these consumables is likely to make up 60 to 80 percent of the overall hard costs of ownership (Total Cost of Ownership or "TCO"), compared to 10 to 15 percent for the initial hardware costs and 5 to 10 percent for paper supplies[1].

But because these reported yields are not based on standard methodologies, the press and analysts question the use of the published claims. An article in Lyra's Hard Copy Supplies Journal titled "Can Manufacturer's Ink Cost-Per-Page Claims Be Believed" highlights this issue[2]. Although this article deals specifically with ink yield, the measurement issues apply to toner yields, as well. The article points out that one printer vendor's published ink yield claims differed significantly from those of two independent test labs using differing measurement processes:

> "The most important reason why a standard test methodology is needed is consumer fairness. Currently, the consumer has no idea what the operating cost of a printer will be when it is purchased. The consumer cannot even compare one manufacturer's stated cost per page against another's because of the different ways they are measured."

Historically, printer vendors have measured yield by printing a page that had 5 percent ink or toner coverage for monochrome pages, or a series of pages with 5 percent coverage for each color cartridge (CMYK) used in color printers. While this sounds simple, several factors make it difficult to compare yield results when differing test methods are used:

- Is 5 percent coverage based on the physical size of the page, the device's printable area, or some other criteria?

[1] QualityLogic, Inc., "Printer Total Cost of Ownership Assessment White Paper" August 31, 2004, http://www1.us.dell.com/content/topics/global.aspx/solutions/en/print_solutions?c=us&cs=04&l=en&s=bsd.

[2] Lyra Research, Inc., The Hard Copy Supplies Journal, September 2004.

- What paper size is used for the yield calculation?
- Because of differing imaging algorithms used to optimize image quality, the same test page may use different amounts of ink or toner when printed on two different printers.
- The definition of what constitutes end of life for a cartridge is left to the subjective judgment of the printer vendor.
- Color calibration, intermittent printing, and a large number of other factors can influence the test results for color ink or toner and each manufacturer uses a proprietary methodology to account for these factors.

Standardized Yield Tests

The printer industry has an immediate need for a consistent yield assessment methodology so that products can be compared competitively in a fair manner. The industry has adopted standard methods for measuring page yields, with all of the major manufacturers supporting the standardization.

Toner and Ink Yield Standards

An international effort resulted in methodologies for measuring monochrome toner yield (ISO/IEC 19752), color toner yield (ISO/IEC 19798), and monochrome and color ink yield (ISO/IEC 24711). These standards use well-defined documents as test pages rather than specifying a coverage percentage. The standards also address many of the other issues noted above that impact consistency of yield results in the industry.

1. The ISO standards are intended to provide accurate, standardized yield specifications for printer model/cartridge model combinations.
2. The ISO standards use the same pages for all printers. While the ISO page may cause variations from a 5 percent page for a specific printer, the comparative yield measurements are realistic. Testers have no latitude to manipulate the page designs to achieve desired results and are not required to conduct elaborate page coverage measurements in the process.
3. The ISO standards are designed to measure a statistically valid average for the cartridge model, testing a minimum of 3 cartridges of each color on a minimum of 3 printers and averaging the results.
4. The ISO standards print the cartridges to a defined End-of-Life so that the real yield is measured.

Reported Yield vs. ISO-Measured Yield

In order to illustrate the impact that differences between reported and ISO-measured yields can have on a TCO calculation, we looked at a simple model to see the sensitivity of TCO to these changes. The table shows the percentage impact on the overall TCO calculation that consumables (ink/toner) represent versus the percentage difference between reported and ISO-measured yield. For instance, if the reported yield is 15 percent *less* than the ISO-measured yield, and if consumables accounted for 70 percent of the TCO, then the reported TCO would calculate costs 10.5 percent *higher* than it would actually be if all printing were done with pages that approximated the ISO standard. In this scenario, specifying the reported yield rather than the ISO-measured yield puts this printer at a TCO disadvantage.

	% Change: ISO versus Reported				
% of TCO	**-5%**	**-10%**	**-15%**	**-20%**	**-25%**
50%	2.5%	5.0%	7.5%	10.0%	12.5%
60%	3.0%	6.0%	9.0%	12.0%	15.0%
70%	3.5%	7.0%	**10.5%**	14.0%	17.5%
80%	4.0%	8.0%	12.0%	16.0%	20.0%
90%	4.5%	9.0%	13.5%	18.0%	22.5%

The converse is also true. If a reported yield were 15 percent *higher* than the ISO-measured yield, then the reported TCO calculation would *underestimate* the TCO by 10.5 percent. In the second scenario, the reported yield (as opposed to the ISO yield) would give the vendor a lower estimated TCO than ISO yield would indicate.

From a printer user's standpoint, TCO comparisons based on standard yield measurements provide a more accurate comparison. Independent, third-party testing using the ISO standard virtually guarantees that, finally, printer buyers can trust specified yield numbers. While other factors should be considered in any buying decision, to the extent that a TCO analysis using an estimated yield influences the decision, then it is important that the comparison be based on a standard apples-to-apples metric.

Color Photo Ink

Additional work continues in the ISO/IEC SC28 standards group to define methodologies for color photo ink yield measurements. In general, this new standard will follow the basic methods defined in the color ink yield standard, but will also address the unique testing challenges associated with color photo printing.

For color photo inkjet devices, QualityLogic has developed an interim test methodology that is consistent with the spirit of the standards work going on in this area and uses the latest proposed test pages. Once ISO/IEC standards are approved for color photo ink, QualityLogic will implement changes to the interim QualityLogic methodology to bring it into conformance with the new standards.