

# Toner/Drum Yield and Cost-per-Print HP LaserJet 1320 and Dell 1700 Laser Printers Comparative Benchmarking

Final Report Presentation

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# Project Objective

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## HP LaserJet 1320 and Dell 1700 Laser Printer

### Toner cartridge/Drum yield

Incorporate sound, unbiased testing methodologies

- *Independent comparative test, sponsored by Hewlett-Packard*
  - SpencerLab attests that its methodology and procedures maintain its reputation for unbiased integrity
- *Use ISO/IEC 19752:2004 monochrome toner cartridge yield methodology*
  - Test five cartridges on each of three printers from each manufacturer
  - Test under controlled temperature and humidity environment; semi-continuous printing
- *Test both standard and high-capacity OEM toner cartridges*
- *Test drum yield in ISO/IEC 19752 environment*
  - Adapt ISO monochrome test methodology for drum yield testing
  - Test three Dell drums, each on one of three printers
  - Intermittent testing, to simulate user-environment

Calculate and compare Toner/Drum Cost-per-Print

- *Combine test results with manufacturer's published cartridge prices*
  - Use tested drum yield to establish Dell drum cost contribution; HP drum is included within toner cartridge



# Significant Findings

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## Toner Cartridge Yield

### Test Results vs. Manufacturer's Ratings (Standard and High-Capacity)

- *While HP exceeded its rated yield by 10% on both cartridges, Dell tested below its Rated Yield on both (-6% and -17%)*
- *Although Dell's standard cartridge yield is rated 20% higher than HP's, Dell's tested yield was only 2% higher than HP*
- *Although Dell's high-capacity cartridge yield is rated equal to HP's, HP tested 33% higher than Dell*

## Drum Yield

- *Dell printers indicated drum End-of-Life 11% short of Rating*

## Cost-per-Print...



# Significant Findings (cont'd)

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## Toner/Drum Cost-per-Print

SpencerLab Tested Yield and HP/Dell “Use and Return” Cartridge Prices

- *Analyses used Cost-per-Cartridge/Drum and Pages-per-Cartridge/Drum tested yield*
  - Cost-per-Cartridge/Drum was from the manufacturer’s web site’s direct purchase pricing

## Standard Cartridges:

HP had the lowest Toner/Drum Cost at 2.61¢-per-Print

- *Dell’s “Use and Return” Cost-per-Print was 2% higher*

## High-Yield Cartridges:

HP had the lowest Toner/Drum Cost at 1.99¢-per-Print

- *Dell’s “Use and Return” Cost-per-Print was 1% higher*

Customers not opting for “Use and Return”, and using “Regular” cartridges, pay the higher Dell price

- *Standard Cartridges: Dell “Regular” cartridge at 3.73¢-per-Print is 43% higher than HP*
- *High-Yield Cartridges: Dell “Regular” cartridge at 2.81¢-per-Print is 41% higher than HP*



# Methodology

## Toner cartridge yield testing complied with ISO/IEC 19752:2004

Yield was tested with an ISO 19752 test page and driver default settings for plain paper

- *Fifteen (15) cartridges each of standard and high-yield were tested for each printer*
  - Five cartridges on each of three printers; only “Use and Return” cartridges were tested for Dell
- *Machines were run in semi-continuous mode (per ISO 19752)*
  - Automatic paper sensing was disabled to prevent possible error
  - Stops were for paper replenishment, jam clearance, and overnight
- *Testing was performed under ISO 19752 environmental controls*
  - 23° ± 2°C temperature; 50% ± 10% relative humidity

Cartridge Yield was the number of pages printed until End-of-Life, determined by Fade

- *End-of-Life and Fade determined per ISO 19752 definition*
- *None of the tested machines employed a TONER-OUT stop*
- *After the “Toner-Low” signal on the control panel, the cartridge was first shaken; upon fade the cartridge was shaken again; the second fade determined End-of-Life*

“Declared” page yield was calculated with ISO confidence factors

## Drum Yield testing

ISO 19752 test procedures adapted; no ISO standard for drum yield available

- *Included ISO test document • Environmental controls*

Three (3) drums tested to End-of-Life

- *Three drums, one on each of three printers*
- *“Replace Drum” signal on control panel determined End-of-Life*
- *Machines were run intermittently*
  - Return-to-ready
  - Two-page job length



## Methodology (cont'd)

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### Cost-per-Print:

Toner Cartridge Cost divided by Declared Page Yield

° *Plus*

Drum Cost divided by Declared Drum Page Yield

### Toner and Drum Cartridge Prices

° *Pricing was obtained from manufacturer's web sites*

- Dell "Use and Return" cartridges are purchased at a special price with the understanding of one-time use and return to Dell. "Regular" cartridges are offered at regular prices without these terms

Drum End-of-Life same as cartridge for HP; printer indication for Dell



# Test Results

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## The following tables and charts present the test results & analyses

### Toner Cartridge Page Yield (Pages-per-Cartridge) and Toner Usage

- Standard and High-Capacity Cartridge Page Yield

◦ *Test results (chart)*

◦ *Comparison with Manufacturer's rating*

### Drum Yield

◦ *Comparison with Manufacturer's rating*

### Cost-per-Print

- Standard and High-Capacity Cartridges plus Drum Cartridges
- Dell "Regular" and "Use and Return" Cartridge pricing
- HP Toner Cartridge pricing



# Cartridge Page Yield

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## Test Document

ISO “Standard Page File”

## Standard Cartridge

Manufacturer Rating

° HP: 2,500 pages

° Dell: 3,000 pages

Individual Page Yield

° HP average: 2,786 pages

° Dell average: 2,896 pages

“Declared” Page Yield

° HP: 2,762 pages

° Dell: 2,826 pages

## High-Capacity Cartridge

Manufacturer Rating

° HP: 6,000 pages

° Dell: 6,000 pages

Individual Page Yield

° HP average: 6,658 pages

° Dell average: 5,110 pages

“Declared” Page Yield

° HP: 6,589 pages

° Dell: 4,956 pages



# Page Yield – Standard Toner Cartridge

## ISO Standard Toner Cartridge Test Results: “Declared” Page Yield

HP exceeded its rated yield (+10%)

Dell did not meet its Rated Yield (-6%)

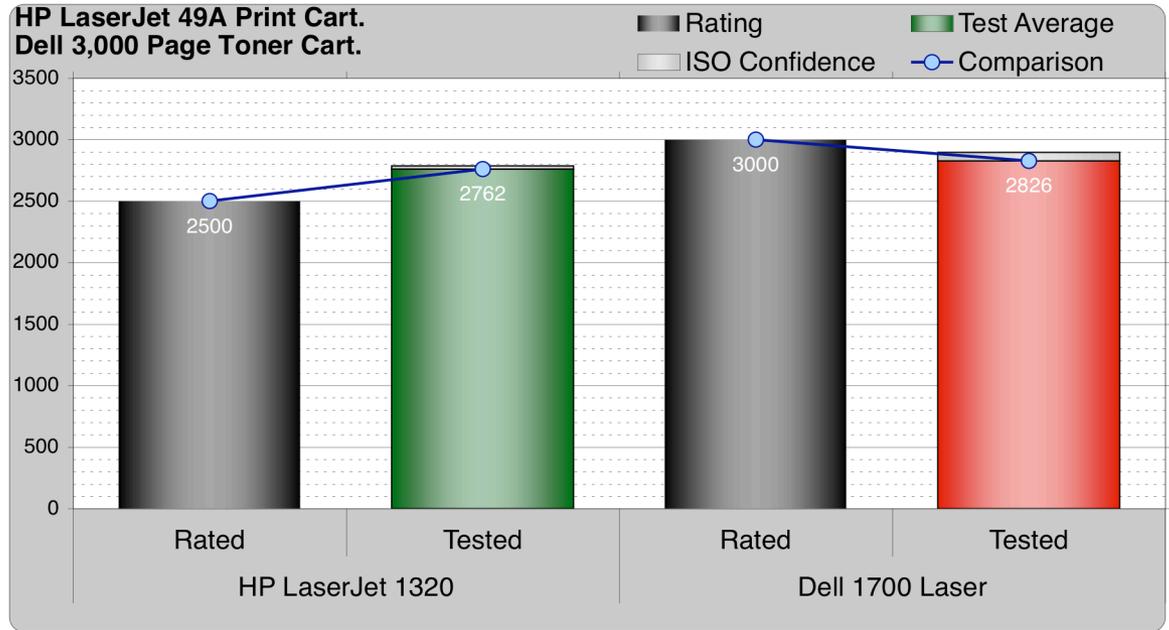
Dell’s tested yield was only 2% higher than HP’s tested yield

° But Dell’s rating is 20% higher than HP’s

Percentage of fifteen tested cartridges to meet or exceed manufacturer’s rating

° 100% of tested HP cartridges

° Only 13% of tested Dell cartridges



Standard	HP LaserJet 1320		Dell 1700 Laser	
	Rated	Tested	Rated	Tested
Rating	2500		3000	
Test Average		2785.9		2895.6
ISO Confidence		23.9		69.6
<b>TOTAL</b>	<b>2500</b>	<b>2762</b>	<b>3000</b>	<b>2826</b>



# Page Yield – High-Capacity Toner Cartridge

## ISO High-Capacity Toner Cartridge Test Results: “Declared” Page Yield

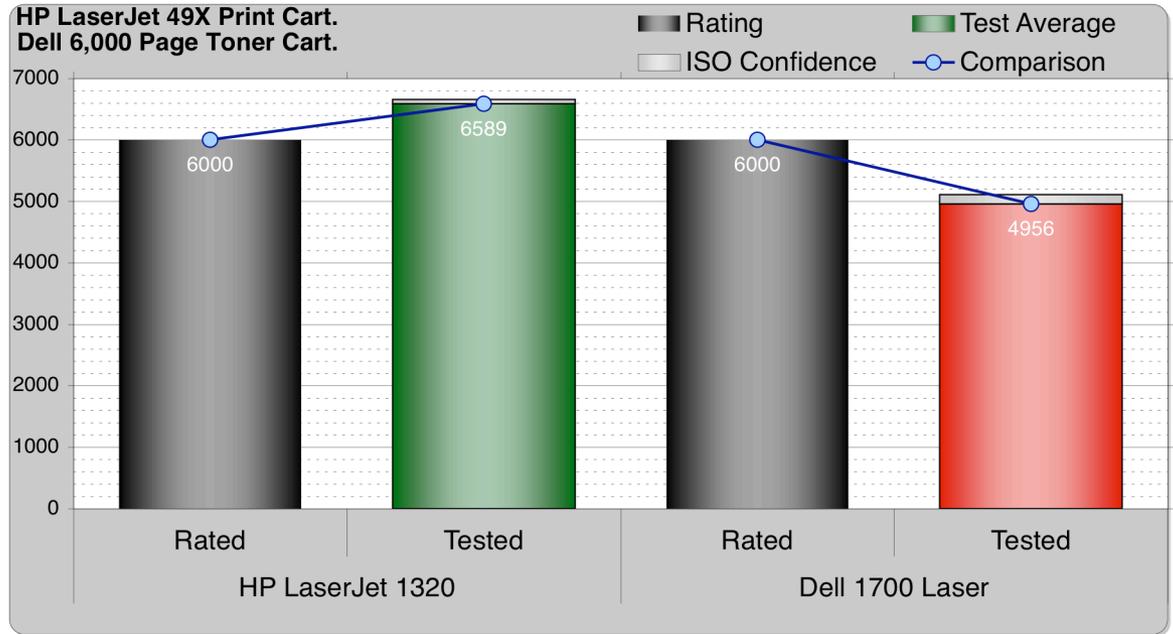
HP exceeded its rated yield by 10%

Dell did not meet its rated yield by 17%

HP tested yield was 33% higher than Dell’s tested yield

Percentage of fifteen tested cartridges to meet or exceed manufacturer’s rating

- 100% of tested HP cartridges
- 0% of tested Dell cartridges



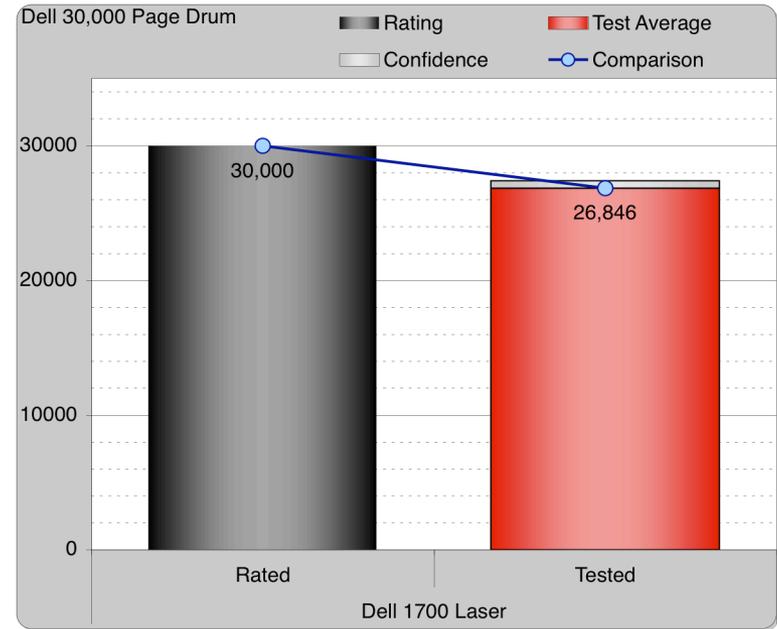
High Yield	HP LaserJet 1320		Dell 1700 Laser	
	Rated	Tested	Rated	Tested
Rating	6000		6000	
Test Average		6658.1		5110.3
ISO Confidence		69.1		154.3
<b>TOTAL</b>	<b>6000</b>	<b>6589</b>	<b>6000</b>	<b>4956</b>



# Drum Yield

## Drum Yield Test Results

Dell did not meet its suggested rated yield by 11%



High Yield	Dell 1700 Laser	
	Rated	Tested
Rating	30,000	
Test Average		27,401
90% Confidence		555
<b>TOTAL</b>	<b>30,000</b>	<b>26,846</b>



# Cost-per-Print — Analysis: Toner and Drum Cartridges

## Cost-per-Print:

Toner Cartridge Cost  
divided by

Declared Page Yield

° Plus

Drum Cartridge Cost  
divided by

Declared Page Yield

	Printer	HP LaserJet 1320	Dell 1700 Laser Printer	
	Toner Cartridge	Q5949A/Q5949X	310-5401/5402 "Regular"	310-5399/5400 "Use and Return"
Toner Cost per Cartridge	Standard	\$71.99	\$99.99	\$69.99
	High Yield	\$130.99	\$129.99	\$89.99
Pages per Cartridge	Standard	2,762	2,826	2,826
	High Yield	6,589	4,956	4,956
Toner Cost per Print	Standard	2.61 ¢	3.54 ¢	2.48 ¢
	High Yield	1.99 ¢	2.62 ¢	1.82 ¢
Drum Cartridge Cost	Replacement	N/A	\$49.95	\$49.95
Pages per Drum			26,846	26,846
Drum Cost per Print			0.19 ¢	0.19 ¢
Toner & Drum Cost per Print	Standard	2.61 ¢	3.73 ¢	2.67 ¢
	High Yield	1.99 ¢	2.81 ¢	2.01 ¢

Results based on [SpencerLab](#) Digital Color Laboratory yield test results, September 2004  
Manufacturer pricing per Hewlett-Packard and Dell web sites as of 10/04/04

## Toner and Drum Cartridge Cost

Direct from manufacturer's web site

° Dell offers optional "Use and Return" toner cartridges with different part numbers

## Standard Cartridges:

HP was the lowest Toner/Drum Cost at 2.61¢-per-Print

° Dell's "Use and Return" Cost-per-Print was 2% higher

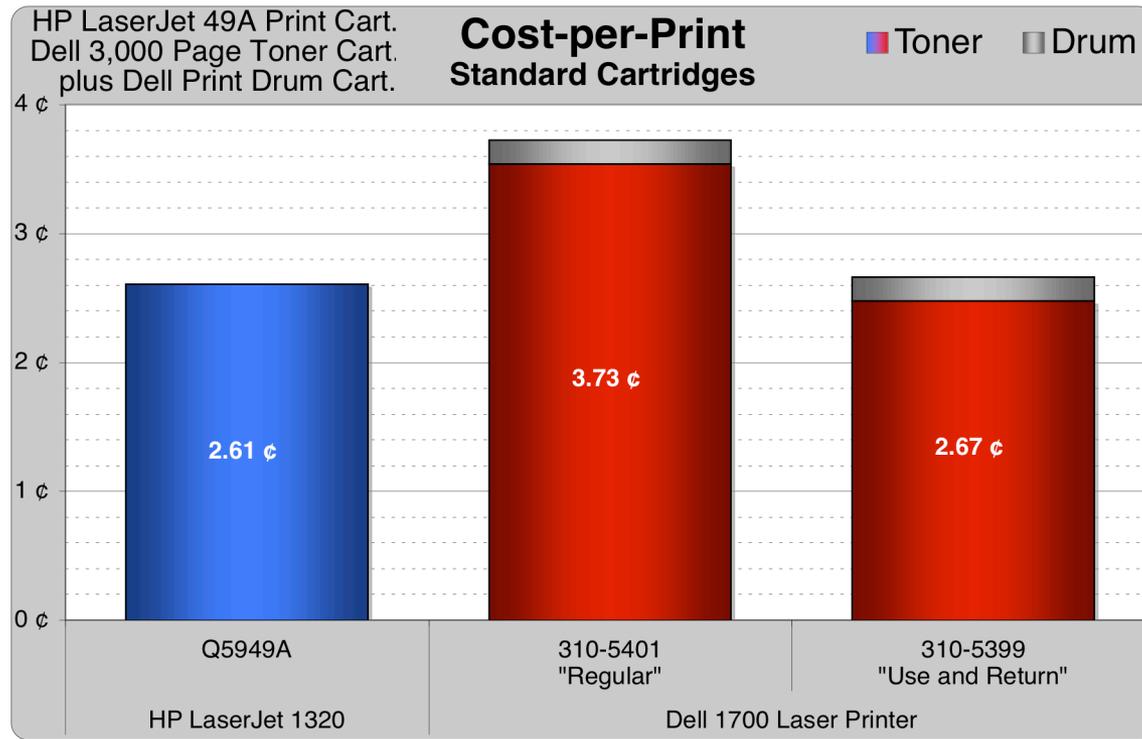
## High-Capacity Cartridges:

HP was the lowest Toner/Drum Cost at 1.99¢-per-Print

° Dell's "Use and Return" Cost-per-Print was 1% higher



## Cost-per-Print — Standard Cartridges



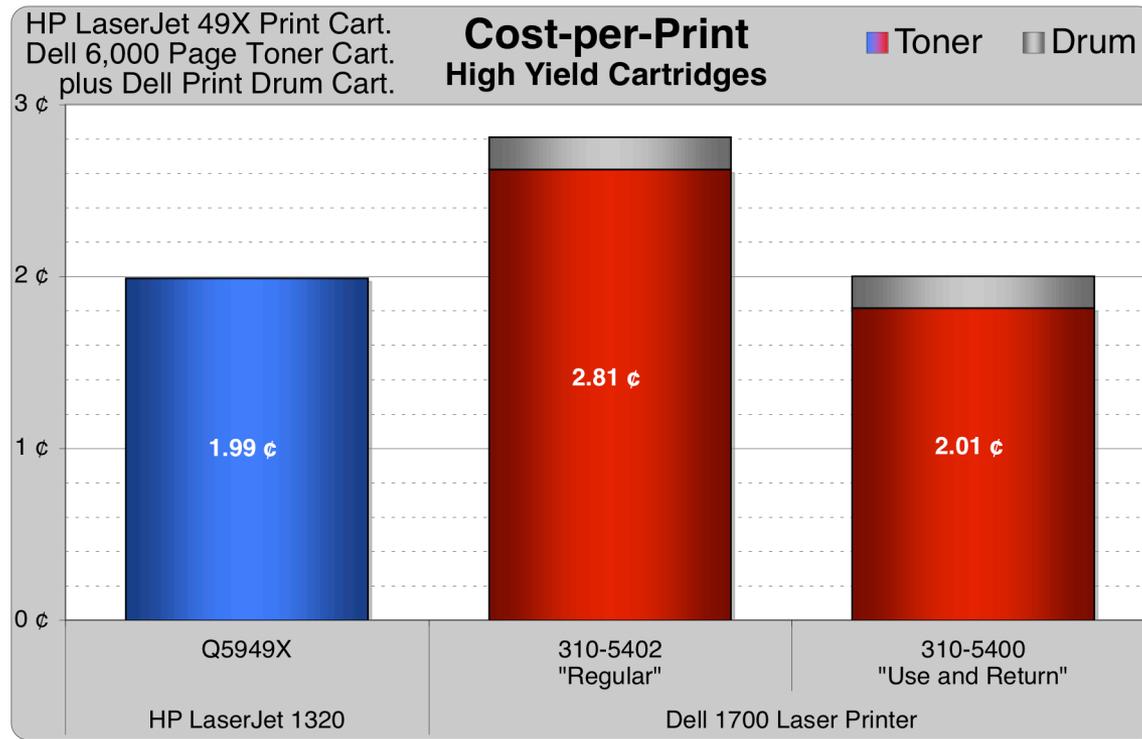
**Dell Standard Toner and Drum Cartridges yielded higher Cost-per-Print than HP**

Dell's "Use and Return" Cost-per-Print was 2% more expensive than HP

Dell's "Regular" cartridge Cost-per-Print was 43% more expensive



## Cost-per-Print — High-Yield Cartridges



**Dell High-Yield Toner, Drum Cartridges yielded higher Cost-per-Print than HP**

Dell's "Use and Return" Cost-per-Print was 1% more expensive than HP

Dell's "Regular" cartridge Cost-per-Print was 41% more expensive



# Thank You — The SpencerLab Project Team

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