

Monochrome Cartridge Reliability Comparison Study – 2018

HP LaserJet Toner Cartridges vs. Clone Brands in Asia

The *spencerLAB* DIGITAL COLOR LABORATORY has conducted a cartridge reliability comparison testing of original HP Inc. (HP) Monochrome LaserJet toner cartridges and non-HP clone brands of monochrome toner cartridges sold in Asia (AP). The test included CF280A (80A), CE285A (85A), and CC388A (88A) cartridge models for the HP LASERJET PRO 400 M401n, HP LASERJET PRO P1102w, and HP LASERJET PRO MFP M126nw, respectively. The Non-HP brands tested were Print-Rite, ProDot, G&G, and Black Magic. Ten cartridges of each brand were tested to get statistically significant overall results.

The analysis compared the Reliability throughout the life of the toner cartridge models tested for each brand. Cartridge Reliability factors, such as Dead-on-Arrivals (DOA), Premature Failures (PF), and Low Quality (LQ) cartridges [see definitions in Appendix 3], were evaluated to determine the total number of Problem Cartridges for each brand.

KEY FINDINGS

- Testing of the Original HP toner cartridges yielded no Problem Cartridges, whereas 79% of the Non-HP cartridges exhibited some type of reliability problem, such as Dead on Arrival, Premature Failure, or Low Quality.
- Of the 70 Non-HP cartridges tested from all SKU's, 22 cartridges were DOA, 1 was Premature Failure, and 33 cartridges were Low Quality.
- 31% of the printed pages produced by the Non-HP brands were unacceptable for any type of use, whereas Original HP cartridges produced no unacceptable pages.
- Throughout testing, the Non-HP brands required cleaning procedures, as per printer manufacturer guidelines, as an attempt to improve loss of quality. Tested HP cartridges did not require any cleaning procedures.

The *spencerLAB* DIGITAL COLOR LABORATORY, a division of Spencer & Associates Publishing, Ltd., is an independent test laboratory with a broad base of industry clients. Although this independent comparative study was commissioned by HP Inc., *spencerLAB* believes these results maintain its reputation for the integrity of its procedures and analyses. Results stated herein are based upon direct testing by *spencerLAB* of actual products believed to be representative.

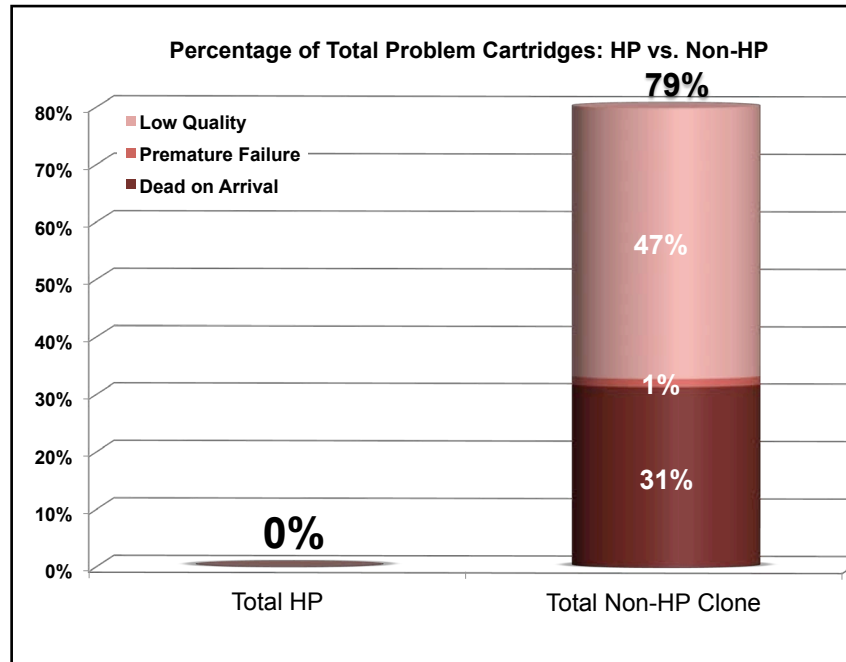
TEST RESULTS

CARTRIDGE RELIABILITY: PROBLEM CARTRIDGES

HP cartridges were significantly* more reliable than the tested Non-HP brands.

None of the tested HP cartridges were deemed Problem Cartridges (DOA, PF, or LQ).

Most of the Non-HP brands of toner cartridges suffered from Reliability issues including DOA, PF, and LQ; yielding a total of 79% Problem Cartridges out of the 70 tested. DOA cartridges accounted for 31%, Premature Failure cartridges for 1%, and Low Quality cartridges for 47% of the Non-HP cartridges. For the average user, Problem Cartridges are disruptive, causing inconvenience due to a lack of reliability, which impacts and increases the overall cost of printing.



THE spencerLAB DIGITAL COLOR LABORATORY

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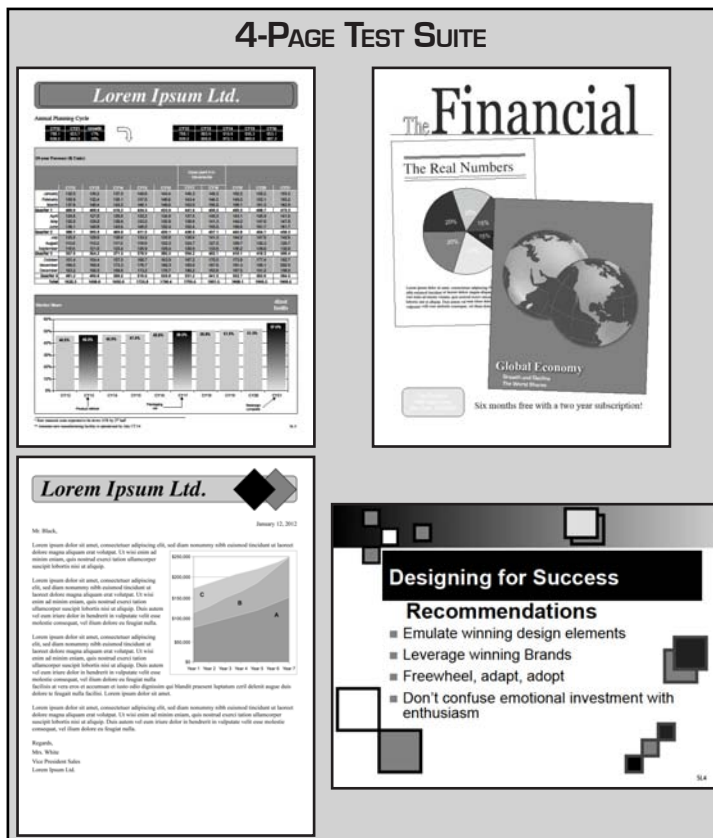


APPENDIX 1: ADDITIONAL BRAND RESULTS

LOW QUALITY SAMPLES



Images magnified to show Print Quality defect. Images may not be accurately reproduced when printed from this report.



APPENDIX 2: METHODOLOGY

TEST PARAMETERS

The test included CF280A (80A), CE285A (85A), and CC388A (88A) cartridge models for the HP LASERJET PRO 400 M401n, HP LASERJET PRO P1102w, and HP LASERJET PRO MFP M126nw, respectively. The Non-HP brands tested were Print-Rite, ProDot, G&G, and Black Magic. Ten cartridges of each brand were tested to get statistically significant overall results.

A four-page PDF test suite was printed from a Windows 10 operating system, using Acrobat Reader 2018.009.20044. Test files were printed in default mode for plain paper, using the latest printer drivers available from HP's website, on Hammermill Fore Multi-Purpose 20lb., 96 Brightness, office paper. All test printing was performed by *spencerLAB*.

Two new HP test printers were assigned to each toner cartridge brand and model in order to avoid cross-contamination of brands and to minimize printer-to-printer performance variation. HP OEM starter cartridges in all test printers were depleted prior to the target cartridges being installed for testing. All test supplies, such as printers, toner cartridges, and paper, were acclimated to the testing environment of 23C° +/- 2C° and 50% +/-10% RH for at least 12 hours prior to testing. Printing was performed in a semi-continuous manner, with stops for paper replenishment, overnight, etc., until toner cartridges reached End-of-Life (EOL). EOL is defined as any one page of the four-page suite degrading to an unacceptable level of quality, which would render the print too poor to be used for any type of use. As per the printer manual, one shake procedure and one cleaning function was performed prior to a cartridge being deemed EOL.

CARTRIDGE RELIABILITY TESTING

Prior to printing, all cartridges were carefully unpacked and inspected for any toner leakage and/or broken parts; all DOAs were noted and photographed.

APPENDIX 3: TEST TERMS AND DEFINITIONS

Terms	Definitions
End-of-Life, (EOL)	<p>A condition determined by one of three mechanisms:</p> <ol style="list-style-type: none"> 1. Cartridge is Dead on Arrival. 2. Cartridge stops printing and efforts to recover are unsuccessful. 3. Degradation of quality to unacceptable for any one of the Test Suite pages. Any printer documentation recommendations are performed no more than two times to recover quality. After the second recovery, if quality does not recover or degrades to an unacceptable level, EOL is reached and marked before pages of unacceptable quality.
Dead on Arrival, (DOA)	<p>A condition determined by one of four mechanisms:</p> <ol style="list-style-type: none"> 1. A cartridge that has at least 50% of the handling surface covered in leaked toner, before or during the installation process and/or toner visibly spilled in the plastic bag containing the cartridge and/or on the exterior of the cartridge. 2. A cartridge that within the first ten pages has at least one page categorized as unacceptable, and does not improve during the recovery process. <ul style="list-style-type: none"> • Recovery process requires following the printer manual instructions for correction of the noted defect, or if the defect is not addressed in the manual, the first attempt to recover shall be to remove the cartridge and perform a shake procedure. Following this recovery process, ten more pages shall be printed and evaluated. If at least one page is categorized as unacceptable, a second recovery attempt of printing a cleaning page, if available, shall be performed. Following the second recovery procedure, ten more pages shall be printed and evaluated for quality. If at least one page is categorized as unacceptable following this recovery process, the cartridge is DOA. 3. Cartridge is broken or missing parts. 4. Cartridge fails to operate upon installation and does not recover upon removing the cartridge and re-installation.
Premature Failure, (PF)	<p>A cartridge with a page count of less than 50% of the average page count for all HP toner cartridges of that model that were not DOA, unless non-HP cartridge stated yield differs from HP stated yield.</p>
Low Quality, (LQ)	<p>A cartridge with 75% or more pages categorized as Limited Use, but was not DOA or PF.</p>
Problem Cartridges	<p>Cartridges categorized as either DOA, PF, or LQ.</p>
Limited Use	<p>Sample pages with quality categorized as unacceptable for any type of use.</p>
Usable Pages	<p>Pages that were acceptable for any use, and not deemed unacceptable.</p>
Non-HP Toner Cartridge	<p>A cartridge that is sold as a substitute for an Original HP cartridge, but was not manufactured nor authorized by HP.</p>

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RELIABILITY TESTED