QualityLogic®
Putting Technology to the Test

Test Report

Quality/Reliability/Yield Study

Brother Printer Cartridges vs. Aftermarket Printer Cartridges

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Executive Summary

In February 2011, QualityLogic completed for Brother a quality, reliability, and yield study comparing original Brother TN650 printer cartridges to two brands of aftermarket TN650 compatible printer cartridges from the United States using the Brother HL-5340D printer.

QualityLogic purchased and tested the following brands:

- Brother
- LD Toner
- Q Toner

Printing was performed in a controlled environment using a test suite developed by QualityLogic.

The results of the study showed that the Brother printer cartridges outperformed all aftermarket printer cartridge brands in print quality and reliability and achieved a more consistent yield than all aftermarket cartridges.

Print Quality

99% of pages printed with Brother printer cartridges were considered acceptable for all uses, including the most demanding Brand documents. On average, only 50% of the pages printed with aftermarket cartridges were Brand quality pages. Print quality classifications are defined in the appendix.

Cartridge Reliability

None of the Brother printer cartridges were considered Low Quality. Overall, 45% of the aftermarket cartridges were considered Low Quality. Every aftermarket brand had at least 20% low quality cartridges. The definition of a low quality cartridge is in the appendix.

Cartridge Yield

Brother cartridges provided a more consistent yield across cartridges with aftermarket brands demonstrating yield variability up to six times greater than Brother.

Test Overview

Print Quality Analysis

The printed output from each cartridge was sampled at approximately 5% throughout the life of the cartridge. These print samples were graded by multiple experienced graders on a four point scale according to the following criteria:

- Brand Documents – Representing the company brand, usually externally. High expectation of quality.
- Knowledge Documents – Effective communication, typically within an organization. Print quality has to be effective, without significant distractions. Often used by an individual to represent themselves to managers and peers.
- Workflow Documents – Documents printed for personal use, often with a short print life or documents incidental to a process. Documents cannot have defects which affect the readability or usability of the document.
- Unusable Documents – Documents with significant print quality degradation resulting in the loss of content.

The the print quality results from all cartridges were combined to compare the overall print quality of that brand.

Cartridge reliability

Cartridges were classified as Low Quality based on the number and quality of the pages printed. If more than 50% of the sampled output from a cartridge was graded below the highest grade, the cartridge was considered Low Quality.

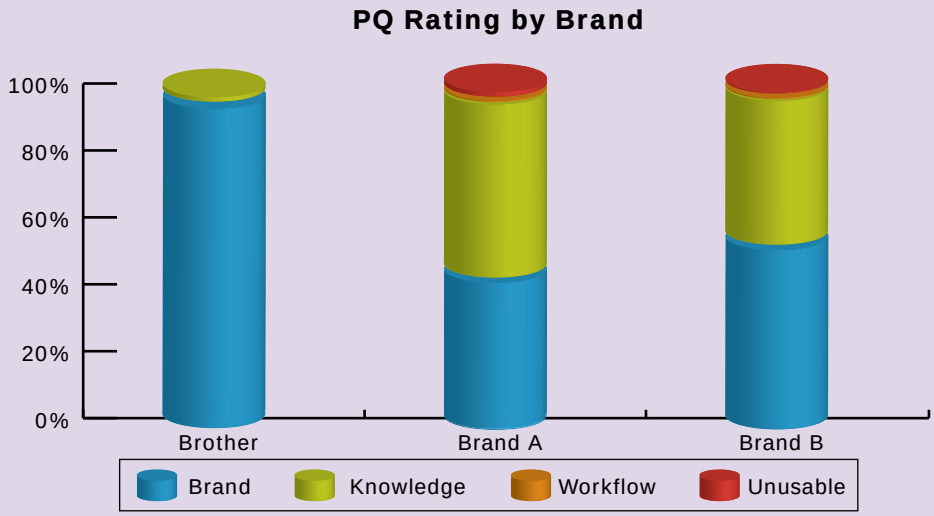
Cartridge Yield

Cartridges were tested using a five-page mono test suite, with an estimated coverage between 15%-20%.

Detailed Results

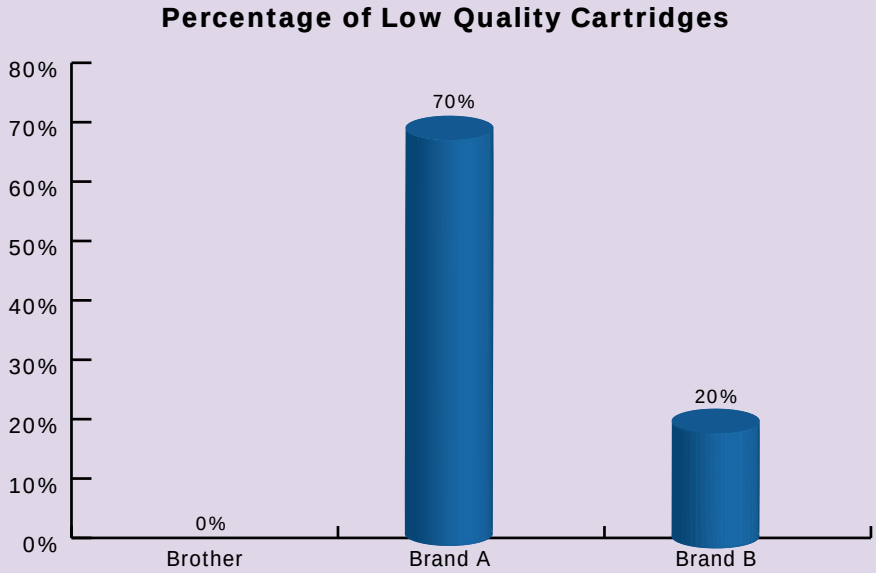
Print Quality

The print quality grading process revealed a significant advantage for Brother printer cartridges in printing documents good enough for all uses, including those most demanding. 99% of the Brother documents received the highest grade. Brother was the only brand that had no documents below the second grade.

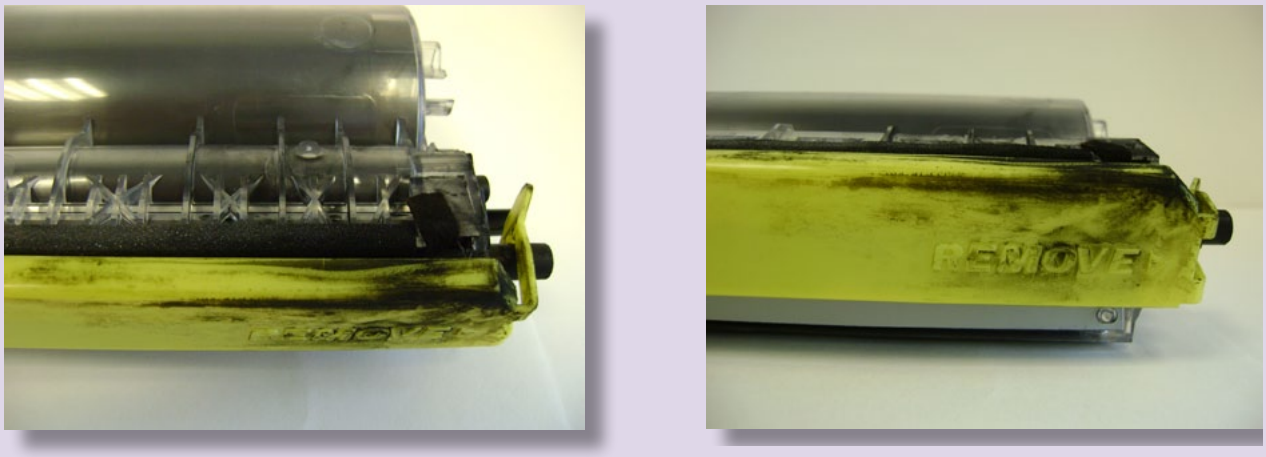


Cartridge Reliability

Brother was the only brand not to have any cartridges classified as Low Quality. A low quality cartridge is defined as a cartridge with less than 50% of the sampled output receiving the highest PQ grade.



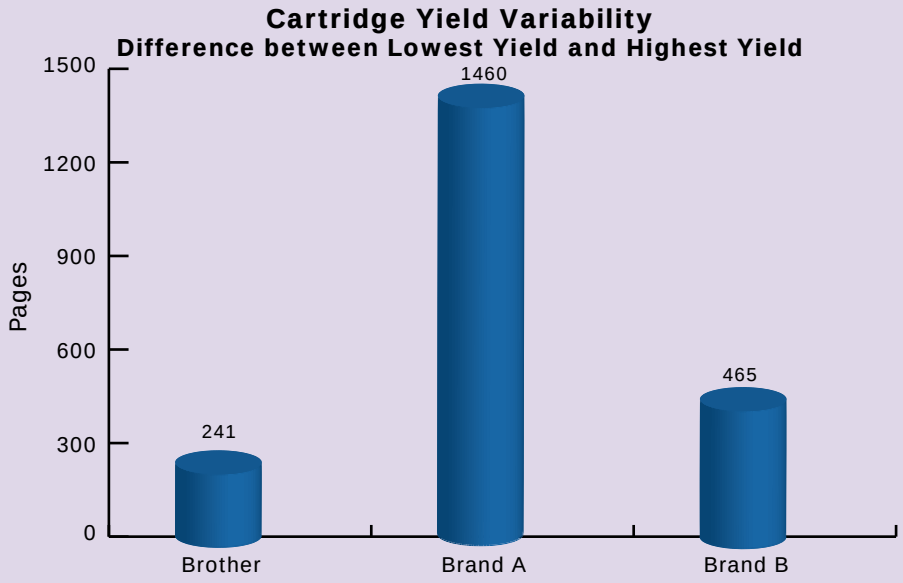
Brother cartridges did not experience any toner leakage in shipping or in printing. Multiple aftermarket cartridges experienced toner leakage during shipment.



Example of toner leakage with a newly opened aftermarket cartridge.

Cartridge Yield

Brother cartridges achieved a yield up to six times more consistent than the aftermarket brands tested. This yield was achieved printing a test suite with an approximate coverage between 15-20%.



Testing Approach

The following is a summary of the methodology used for this study.

QualityLogic purchased all new printers and cartridges used in this study. Six Brother HL-5340D printers were used, two each for each brand of cartridges. Cartridges were purchased in small lots spread over several weeks.

The cartridges listed at right were tested in this study.

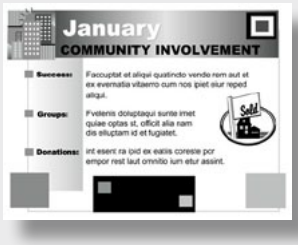
Brother	TN650
LD Toner	LD-TN650
Q Toner	BT650

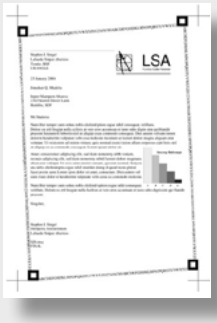
Testing was conducted in an environmentally controlled test lab. All printers, cartridges and media were acclimated to lab conditions for a minimum of 12 hours. Cartridges were depleted printing in semi-continuous mode, stopping for the loading of media, replacing cartridges and breaks for lunch and end of workday.

Ten cartridges were depleted across two printers, five cartridges each. Default printer settings were used. The printers were conditioned using the cartridge shipped with the printer.

A five page mono test suite designed for comparing print quality was used to deplete the cartridges. The coverage of the test suite is estimated at between 15%-20% coverage. Each page was serialized and identified by printer and cartridge to provide exact page counts. The ISO 19752 test page was the final page in the test suite and was used to determine fade which would indicate end-of-life.

The test suite for this study is shown at right.





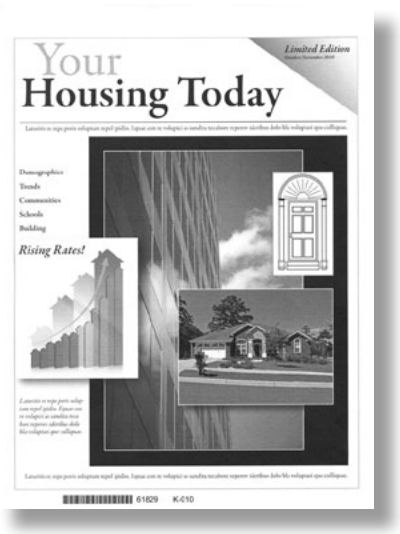
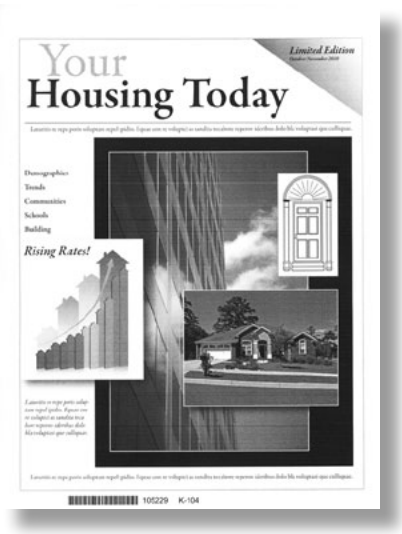
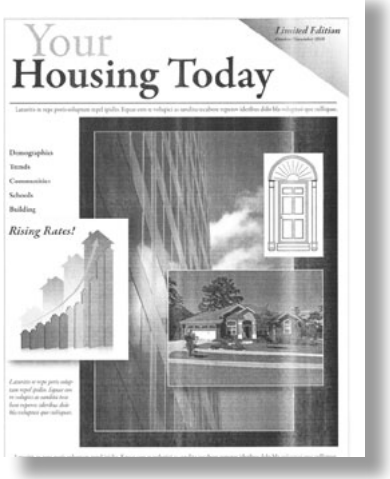
Cleaning procedures were followed at the replacement of each cartridge, including cleaning the corona wire and cleaning the laser window, as per the instructions in the manual.

Pages were sent to the printer using Pageserve, a print testing tool developed by QualityLogic. Each five page job was sent separately, continually keeping additional print jobs in the queue at all times. Pages were quickly inspected, looking for failed print jobs, which could indicate an early end of life. Hammermill Fore MP A4 (20#, 96 brightness) paper was used in the test.

5% of the print jobs were randomly selected and removed for print quality grading. The first four pages of each set (excluding the ISO 19752 page) were graded. Each selected page was inspected by two experienced print quality graders. If the graders did not agree on a score, the page was graded by a third experienced grader and an average score was given.

The pages were graded according to the four point scale (see Appendix for definitions).

Page inspection was performed in a test room with 18-20% reflective neutral gray walls, floor and work surfaces and full spectrum lighting (5,000K +/-500) with luminance of 550 LUX +/-50 at the grading table.

	
Brand	Knowledge
	
Workflow	Unusable

Appendix: Definitions

Test Terminology	Definition
End of Life (EOL)	A condition determined by one of the following mechanisms: 1. Cartridge stops printing and indicates the toner needs to be replaced. 2. Degradation of print quality to Unusable for all pages in the test suite because of fade, streak, extra line, banding or other defect. (A cartridge could be cleaned to attempt to recover the print quality no more than 2 times during the life of a cartridge. Once print quality degraded a 3rd time, the cartridge was considered EOL.) 3. A cartridge leaks substantial toner (1 cm^3 or more) anytime during printing.
Low Quality (LQ)	A cartridge with 50% or more sampled pages categorized below the highest quality Brand documents.
Print Quality Categories	The following 4 categories exist for this study: 1. **Brand Documents** – Representing the company brand, usually externally. High expectation of quality. 2. **Knowledge Documents** – Effective communication, typically within an organization. Print quality has to be effective, without significant distractions. Often used by an individual to represent themselves to managers and peers. 3. **Workflow Documents** – Documents printed for personal use, often with a short print life or documents incidental to a process. Documents cannot have defects which affect the readability or usability of the document. 4. **Unusable Documents** – Documents with significant print quality degradation resulting in the loss of content.