

BLI Custom Test Report

July 2015

Ink Consumption Efficiency Evaluation: Epson's Individual Ink Cartridges Versus Competitors' Tri-Colour Ink Cartridges

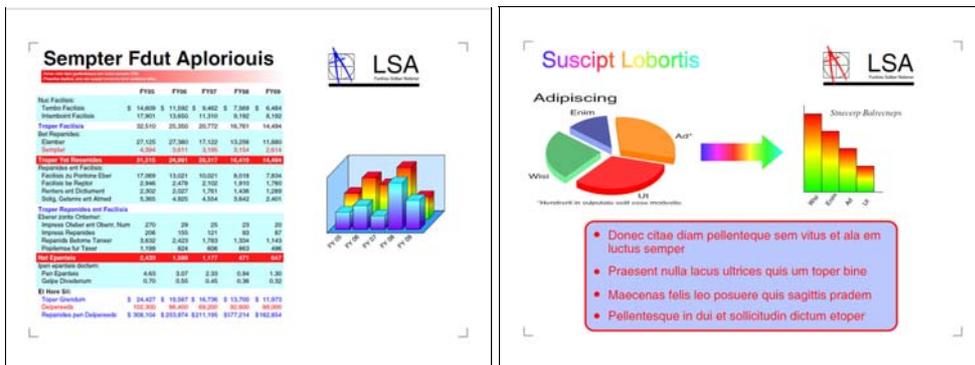
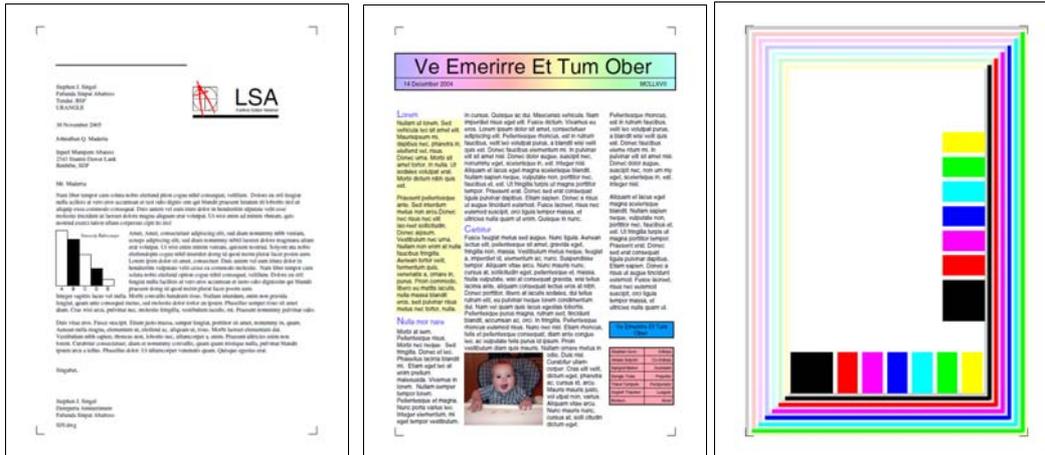
Buyers Laboratory LLC (BLI) was commissioned by Seiko Epson Corporation to conduct testing of Epson's single-colour standard and high-yield ink cartridges to evaluate the efficiency of their total ink consumption performance compared with that of the tri-colour ink cartridges for competitive HP and Canon models. The tests were conducted with two different printing workflows—photo printing and text and graphics based document printing. Printing was performed in a continuous mode in a controlled environment, using print conditions in line with ISO 24734 test methodology but with a custom document suite. Cartridges were run to end of life.

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Workflow Test Materials

A generic text and graphics based document intended to be typical of documents printed in small or home office environments was used in the document workflow test run. This type of printing which covers all home and office requirements can typically show a bias towards corporate brand colours. Printing was performed using UPM Future Multitech 80gsm A4 media, with print conditions in line with ISO 24734 test procedures.



Sample pages from the Document workflow test file

In the photo printing workflow test, a set of 19 photos that show a broad range of settings and themes as would be found in an average customer's photo album was selected. Print quality mode was set to Borderless Photo mode, and Staples A4 190gsm Glossy Photo paper was used on all tested devices, except the Canon PIXMA MG2950, which cannot perform A4 borderless printing.





Sample pages from the Photo workflow test file

Test Devices

Table 1: Device models and tested ink cartridges

Device	Cartridge Type (Standard/High Yield)
Epson EXPRESSION HOME XP-235	29/29XL
Epson EXPRESSION HOME XP-432	29/29XL
Epson EXPRESSION HOME XP-530	33/33XL
Epson EXPRESSION HOME XP-630	33/33XL
Epson WorkForce WF-2630	16/16XL
HP Deskjet 2540	#301/#301XL
HP ENVY 4500	#301/#301XL
HP ENVY 5530	#301/#301XL
HP ENVY 5640	#62/#62XL
HP ENVY 7640	#62/#62XL
HP Officejet 4630	#301/#301XL
Canon PIXMA MG3550	#540 and #541/#540XL and #541XL
Canon PIXMA MG2950	#545 and #546/545XL and #546XL
Canon PIXMA MG4250	#540 and #541/#540XL and #541XL
Canon PIXMA MX495	#545 and #546/#545XL and #546XL

Test Methodology

BLI ran two workflows using standard and high-yield single-colour standard cartridges from Epson and standard and high-yield tri-colour cartridges from HP and Canon. With the test printers set in their default mode and having the latest firmware, BLI operated the printers in continuous simplex print mode for up to eight hours per day. Prior to testing each ink cartridge, the devices were charged with starter cartridges, but it must be noted that the starter cartridges were not used for yield analysis.

After charging, new ink cartridges were tested to exhaustion to evaluate cartridge ink consumption efficiency. Both test suites were used (photo printing and text and graphics based document printing) with at least two cartridges being fully exhausted per device per colour per test suite, and with recharging carried out between each test.

Each cartridge was weighed prior to testing (“Full” weight) and again upon exhaustion (“Used” weight). Cartridge exhaustion was based on when an “ink out”/“empty” notification was displayed by the printer. Average weights based on test results were recorded for full and used weights, and used in the calculations listed in the report. A cleaning routine was carried out in accordance with manufacturer instructions when streaking or other quality defects were exhibited during the test.

One exhausted cartridge of each product type and of each colour was then disassembled and flushed of all unused ink and allowed to dry thoroughly before being weighed to establish “Empty” weight.

The wasted ink ratio of one cartridge was calculated using the following formula. The wasted ink ratio of the colour cartridges is the average wasted ink ratio of cyan, magenta and yellow).

Wasted Ink Ratio =

$$\frac{\text{Weight of Used Ink Cartridge} - \text{Weight of Empty (flushed) Ink Cartridge}}{\text{Weight of New (full) Ink Cartridge} - \text{Weight of Empty (flushed) Ink Cartridge}}$$

$$\text{Weight of New (full) Ink Cartridge} - \text{Weight of Empty (flushed) Ink Cartridge}$$

The overall percentage of ink consumption efficiency was established by using the formula:

$$\text{Ink Consumption Efficiency (\%)} = (1 - \text{Wasted Ink Ratio}) \times 100$$

Pre-flushed and Flushed Ink Cartridges



Epson cyan cartridge pre-flushed and flushed.



Epson magenta cartridge pre-flushed and flushed.



Epson yellow cartridge pre-flushed and flushed.



**Top: Canon 540 standard black cartridge pre-flushed and flushed.
 Bottom: Canon 541XL (high yield) colour cartridge pre-flushed and flushed.**



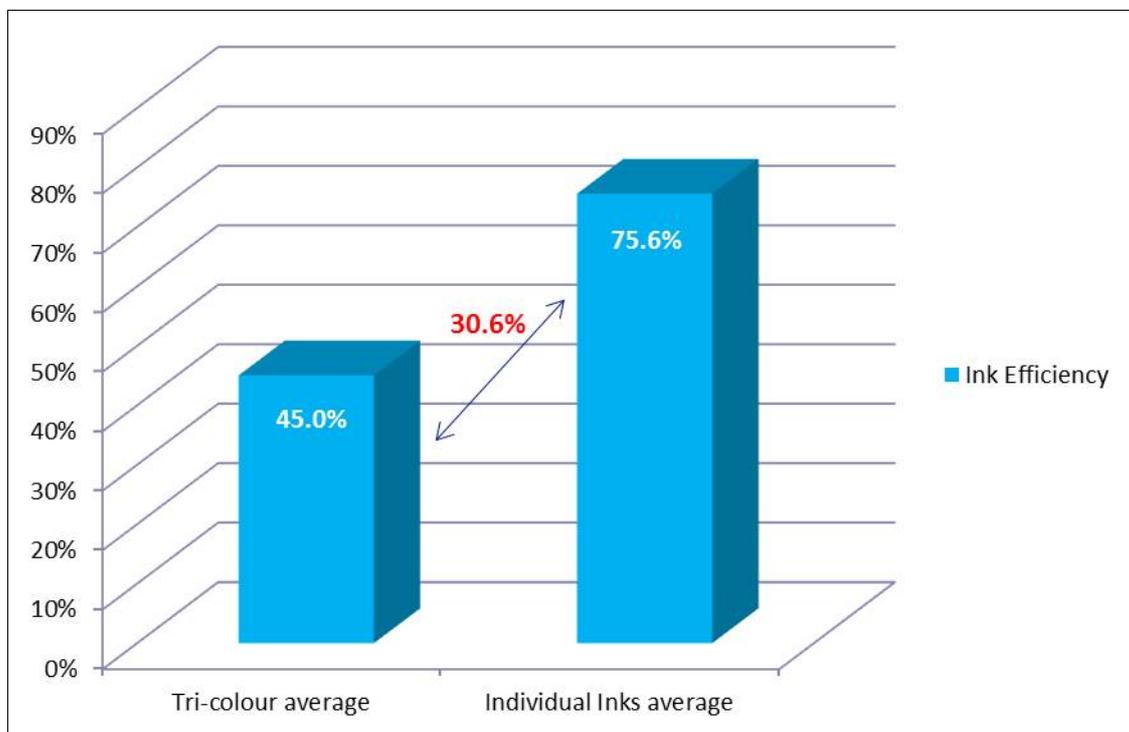
HP 301XL (high yield) colour cartridge pre-flushed and flushed.

Ink Efficiency Performance – Epson Summary of BLI Test Results

In order to give a fair representation of an end user's typical print output, Epson weighted the BLI test results in accordance with the TNS Printing Usage & Attitudes Study - June, 2013 (Appendix A). The TNS Survey demonstrates that end users' propensity to print Documents is 87% compared to 13% for Photos (based on a sample of 1,142 respondents owning a printer costing ≤ 100€/£).

Taking a weighted average of document and photo printing, as described above, and an average of the results for standard and high yield cartridges, the BLI test results show that Epson's individual colour ink cartridges deliver a 30% ink saving compared to competitors' tri-colour cartridges.

Figure 1. Average Ink Efficiency – Document and Photo Printing



Excerpt from BLI test results – Overall Performance

“One notable aspect of Epson's test performance is that Epson offers individual colour ink cartridges, which means inks can be replaced as and when required. Conversely, Canon and HP tri-colour cartridges incorporate cyan, magenta and yellow inks in a single cartridge. This means a cartridge has to be thrown away when any one of the colour inks runs out, even though there are still other colours of ink left in it. At some points in the text and graphics document print test, it was evident that high levels of ink waste were being incurred with

the Canon and HP cartridges due to the disparity in the rates at which inks were being used. The cyan inks were run to depletion at a faster rate than the magenta and yellow inks, and “empty” cartridges still contained a considerable amount of magenta and yellow ink reserves.”

Test Environment/Conditions

All testing was conducted in BLI’s test facility located at 1 Station Industrial Estate, Wokingham, RG41 2YQ. Testing was conducted under ambient conditions of 23.0°C (+/-2°C) and 50% relative humidity (+/- 10%); monitored daily by an Extech RH 520 Humidity and Temperature Digital Recorder.

Conditioning: Printers, paper and cartridges were acclimated to the above conditions for a minimum of eight hours prior to testing. Prior to acclimatisation, packaging and shipping materials were opened in a manner that prevents damage from occurring to the print cartridges during acclimatization. Paper was acclimatized in ream wrapper. Printers, printer components, paper and cartridges were handled in a manner that prevented exposure to condensation.

Test equipment: BLI’s dedicated test network in Europe, consisting of Windows 2008 servers, Windows 7 workstations, 10/100/1000BaseTX network switches and CAT5e/6 cabling.

About Buyers Laboratory Inc.

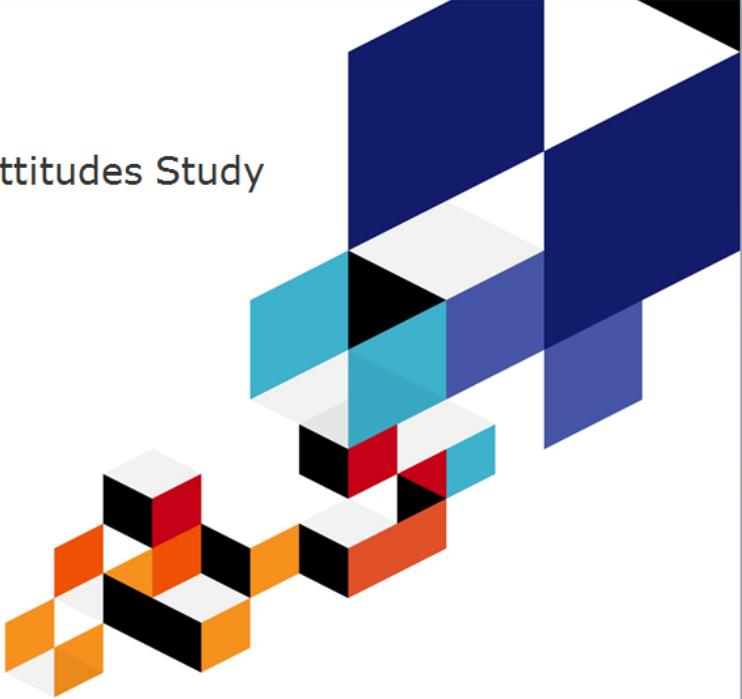
Buyers Laboratory LLC (BLI) is the world's leading independent provider of analytical information and services to the digital imaging and document management industry. For more than 50 years, buyers have relied on BLI to help them differentiate products’ strengths and weaknesses and make the best purchasing decisions, while industry sales, marketing and product professionals have turned to BLI for insightful competitive intelligence and valued guidance on product development, competitive positioning and sales channel and marketing support. Using BLI’s web-based bliQ and Solutions Center services, 40,000 professionals worldwide create extensive side-by-side comparisons of hardware and software solutions for more than 15,000 products globally, including comprehensive specifications and the performance results and ratings from BLI’s unparalleled Lab, Solutions and Environmental Test Reports, the result of months of hands-on evaluation in its US and UK labs. The services, also available via mobile devices, include a comprehensive library of BLI’s test reports, an image gallery, hard to find manufacturers’ literature and valuable tools for configuring products, calculating total cost of ownership (TCO) and annual power usage. BLI also offers consulting and private, for-hire testing services that help manufacturers develop and market better products and consumables.

For more information on Buyers Laboratory, please call David Sweetnam on +44(0) 118 977 2000, visit www.buyerslab.com, or email david.sweetnam@buyerslab.com

Appendix A. Excerpt from TNS Printing Usage & Attitudes Study - June, 2013

Printing Usage & Attitudes Study

7 June 2013

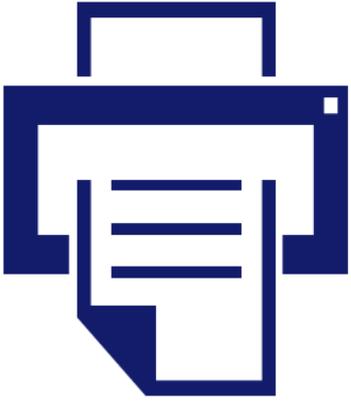


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Background

The TNS Printing Usage & Attitudes Study was commissioned by Epson Europe B.V. to better understand the factors influencing print behaviour in the home and home office in Western Europe.

The following slides have been extracted from the full report to demonstrate the scope of the study and to qualify consumers' printing preferences with regard to documents and photos.



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Profiling



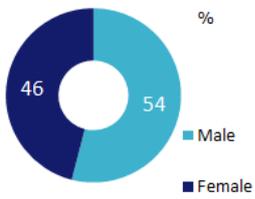
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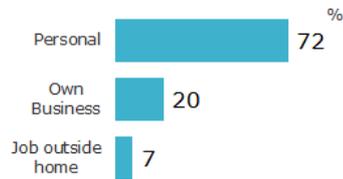
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Profiling: Total European Level

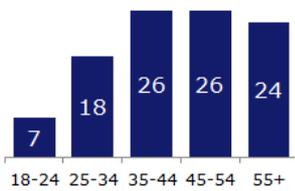
Gender



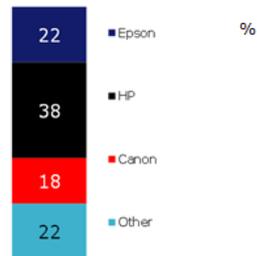
Main usage of the printer



Age



Survey brand ownership



Base: Total Europe (2402)

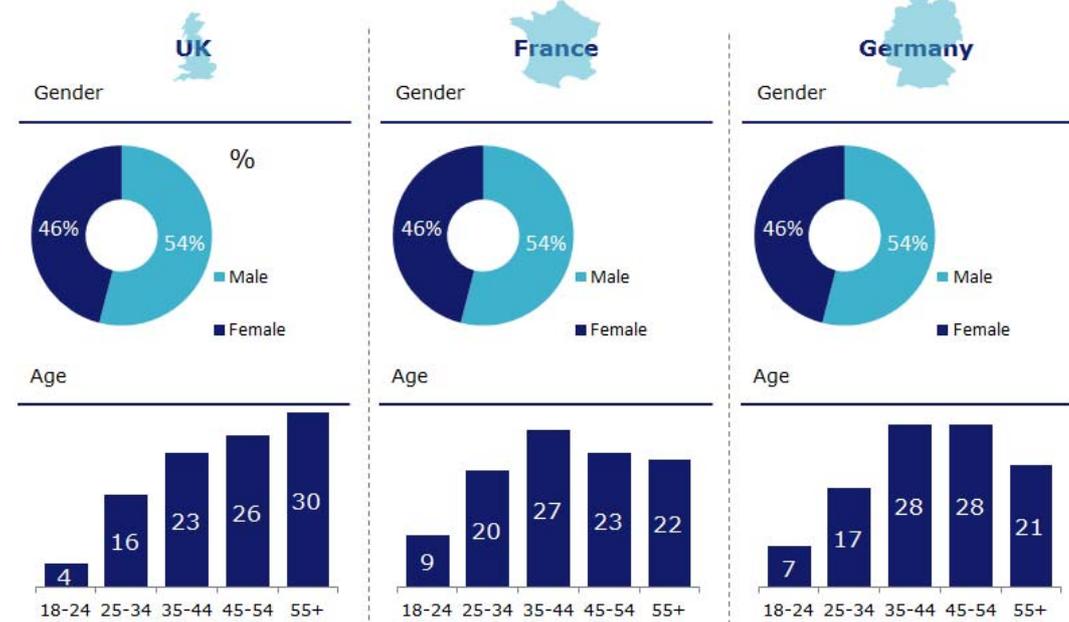


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Profiling: Country Level



Base: UK (801), FR (800), DE (801)



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Printing Preferences - Documents and Photos

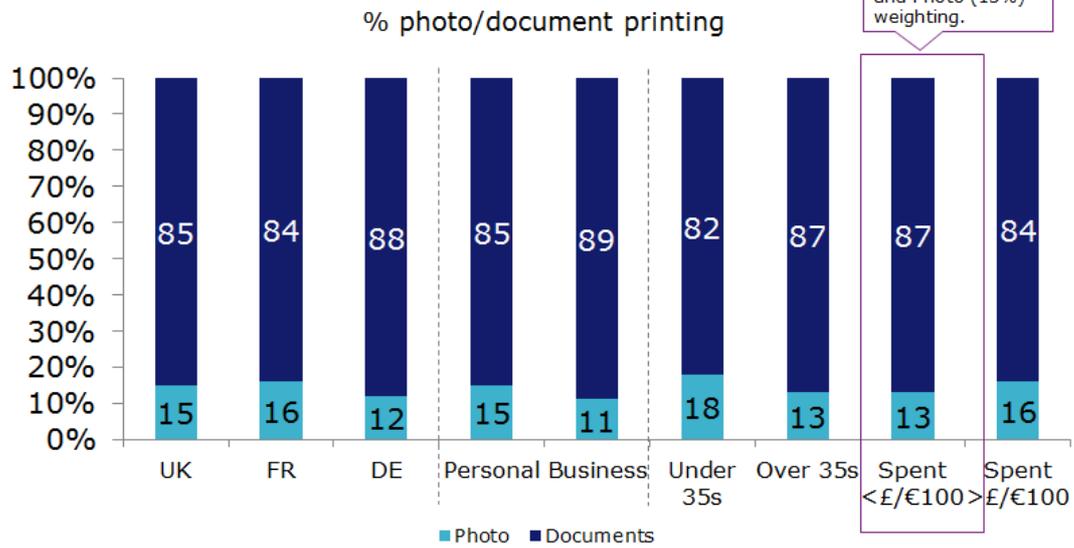


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Printing Preferences – Documents and Photos



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Question: Do you print more photos or other documents?
 Base: Total Europe 2013 (2402), UK (801), FR (800), DE (801), Personal (1733), Business (634), Under 35s (583) Over 35s (1819), Spent <£/€100 (1142), Spent >£/€100 (923)



End



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