



HP PRINTING EFFICIENCY: Helping Customers Save Ink and Money

When making purchase decisions about printers and inkjet print cartridges, customers typically are most concerned with printing capabilities, print quality, speed, product features and ease of use—but cost comparisons are also an important consideration. In comparing costs, customers may look at cartridge price, measurements of page yield and related estimates of cost per page. But cartridge price and cost per page are only *part* of the economic picture.

Some customers also compare cartridge ink volumes in milliliters, but this comparison is not a reliable indication of the relative number of pages that can be printed. HP recommends that customers consider page yield when comparing printers and cartridges, because printers from different manufacturers vary in how they use ink.

A range of other factors—including price, quality, reliability, customer usage and the way printers use ink—impacts printing costs. When comparing costs, customers also need to consider these factors. HP wants customers to have meaningful information on all the factors involved to help them make the best choices for their needs. This article explores how differences in the way printers use ink—known as *printing efficiency*—impact page yields and printing costs.

The impact of efficiency on printing costs

The page yield that customers derive from their printing systems depends on several factors, including their printing habits and how their printing system uses ink both to print pages and to maintain reliable performance.

To keep the ink flowing smoothly and the nozzles clear, all inkjet printers use some of their ink before printing when a new cartridge is installed as well as for system maintenance when the printer has not been used for a while. This ink usage is critical for optimizing printing performance and reliability. Some printers use a lot of ink during this process, while others are engineered to use very little.

Printing efficiency is reflected in the amount of ink available to print pages after accounting for the ink the printer uses in everyday, start-and-stop printing for system maintenance between print jobs. Inkjet printing systems are not equally efficient in their use of ink for system maintenance. Therefore, in comparing printers from different manufacturers, it is important to understand the impact that printing efficiency has on page yields during typical customer usage.

Inkjet cartridge yields quoted by manufacturers and product reviews today typically are measured by printing continuously until the cartridge is empty. Since there is no break in printing, this approach does not account for the ink used for system maintenance during everyday operation. Therefore, testing based on continuous printing does not capture the efficiency differences of different printing systems and may not represent the page yields a customer will actually experience. Much as city and highway driving results in different fuel consumption and fuel economy, customers will experience different page yields based on their actual usage and the efficiency of their printer.

Independent testing assesses the impact of efficiency

To demonstrate the impact of printing efficiency on page yields, HP commissioned an independent study by SpencerLab Digital Color Laboratory.¹ Conducted from April through June 2005, the study tested several manufacturers' popular printer models used by home customers—some with individual ink cartridges and some with tri-color cartridges.²



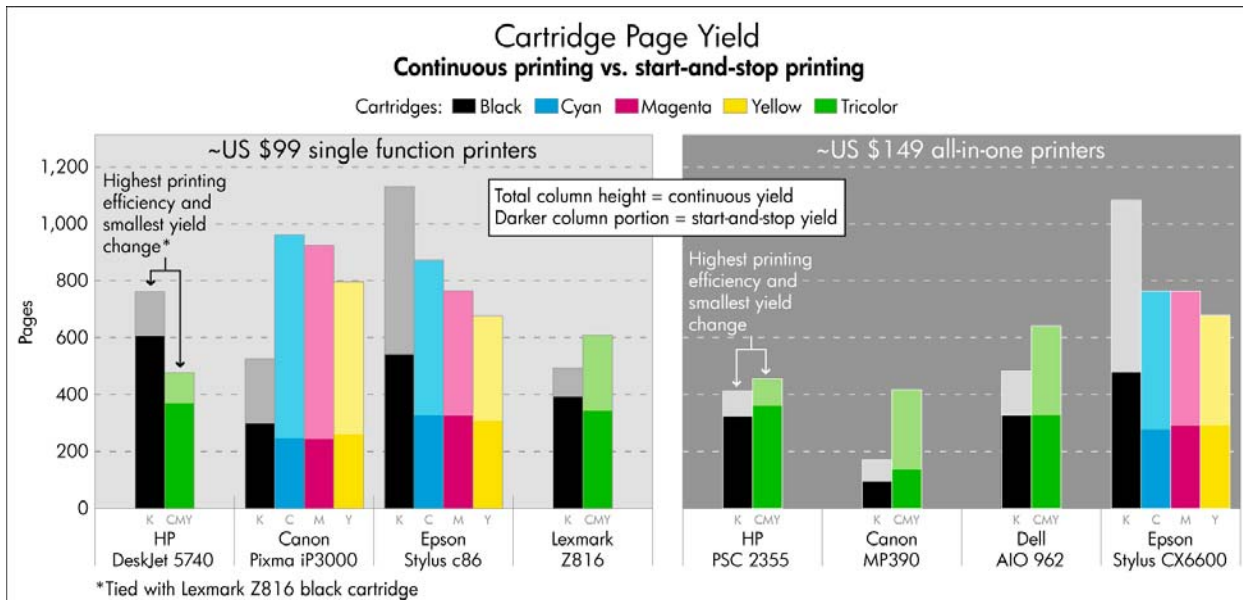
The purpose of the study was to:

- Compare the efficiency of different inkjet printing systems—that is, how much ink they use for maintenance and how much ink is available to them for printing pages, and
- Gain insight into the page yield of inkjet cartridges during typical, start-and-stop customer usage.

The Canon and Epson printers tested used twice as much ink as the comparable HP printers tested to print the same number of pages.¹

The research revealed that:

- Page yields derived from typical start-and-stop printing are different from those measured when printing continuously. The graphs below show that the relative yield rankings of the printers tested change in start-and-stop vs. continuous printing.
 - In both test groups, the HP printers tested demonstrated the smallest percentage change between continuous printing and start-and-stop, or intermittent, printing. Taking into account the relative percentage changes, competitor printers that at first seemed to provide higher yields than HP (based on published yields) ended up with lower actual yields than HP.
- There are significant differences in printing efficiency among the printers tested.
 - The HP printers had the highest average printing efficiency among all the printers tested.
- More efficient design and performance preserve a greater percentage of ink for printing pages.
 - The Canon and Epson individual ink cartridge printers tested used twice as much ink as the comparable HP printers tested to print the same number of pages. This is because the Canon and Epson printers consumed about 50 percent of the supplied ink—significantly more ink than consumed by the HP printers— during system maintenance and cartridge changes.
- Printers with individual ink cartridges for each color are not inherently more efficient than printers with tri-color cartridges. The design and performance of the printing system itself—not the type of cartridge the system uses—determine efficiency.



Page yields derived from typical start-and-stop printing are different from those measured when printing continuously. As shown in the charts above, the relative yield rankings of the printers tested change between start-and-stop printing and continuous printing. In both test groups, the HP printers tested demonstrated the smallest percentage change between continuous printing and start-and-stop printing.¹

How HP delivers efficiency

It is important to look beyond the claims to consider what factors contribute to printing efficiency and costs. For example, a small amount of ink may remain in a depleted tri-color cartridge depending on color



use during printing. However, some HP competitors expend significant amounts of ink for system maintenance.¹ This can be considerably more than the ink left behind in tri-color cartridges during normal use. And HP printers are engineered to use very little ink for system maintenance.

HP printers with tri-color cartridges and with individual ink cartridges deliver exceptional printing efficiency. This results from three design features that closely interact and for which HP has demonstrated technology strengths:

Ink design. HP's patented inks are highly pure and uniquely formulated for non-crusting properties to keep nozzles clear without frequent cleaning cycles. This increases reliability and reduces the need to use ink for maintenance—saving the ink for printing pages.

System maintenance design. HP's patented wiper-blade technology keeps print-head nozzles clean and reliable, and our leak-resistant capping system helps prevent nozzles from clogging during non-use. Both technologies reduce the need to draw ink from the print cartridge to maintain print-head reliability.

Air management. Air, which naturally builds up in inkjet ink, can create bubbles and affect print quality. Advanced HP cartridge technology solves this issue by automatically removing air from the system, without wasting ink.

"Printing efficiency significantly impacts the normal user's page yields and actual printing costs. Our testing revealed striking differences in how efficiently different inkjet printers performed and the effect this had on yields during typical usage."

*– David R. Spencer, President
SpencerLab Digital Color*

HP printing efficiency limits ink consumed for system maintenance and results in higher page yields in typical start-and-stop printing mode when compared to competitors' products under similar conditions.

The design and performance of the printing system itself—not the type of cartridge the system uses—determine efficiency.

Toward a more complete picture of costs

Many factors impact printing costs, so customers should look carefully at the information they use to compare costs. For example, how, what, and how often customers print can impact a printer's use of ink, and therefore the number of pages printed per cartridge. Printing efficiency significantly impacts page yields, and therefore costs.

HP has designed its inkjet printers and cartridges, including both individual ink and tri-color cartridges, for efficient ink usage so customers can save ink and money. When customers compare the costs of different printing systems, HP encourages them to consider not only price of the printer and cartridges, and page yield, but also reliability, quality and efficiency.

The independent test results presented here show that HP inkjet printing products demonstrate excellent yield performance—in the lab and in real life—during the start-and-stop printing typical of actual customer usage. Customers can look to HP products to deliver printing efficiency, along with reliable performance and excellent print quality.

¹Based on printers and usage profiles tested in independent testing, *Inkjet Printing Efficiency: Yield and the Customer Experience*, SpencerLab Digital Color Laboratory, July 2005, commissioned by HP (www.spencerlab.com/reports/efficiency.html).

²Single-function printers tested: HP Deskjet 5740, Epson Stylus c86, Canon PIXMA iP3000 and Lexmark z816. All-in-one printers tested: HP PSC 2355, Epson Stylus CX6600, Canon MultiPASS MP390 and Dell AIO 962.