Reliable printing with HP PageWide Business Printers

HP PageWide Pro and Enterprise printers deliver best-in-class total cost of ownership[1] and fastest speeds[2] along with high energy efficiency.[3] HP PageWide Technology and reliable paper handling allow HP PageWide Pro and Enterprise printers to deliver professional-quality black and color prints page after page.

HP PageWide Pro MFP 577dw

HP PageWide Enterprise Color MFP 586

Introduction

HP PageWide Technology is HP's latest printing innovation, powering printing solutions in HP's business, commercial, and large-format applications. By precisely moving the paper under page-wide, stationary printheads, HP PageWide Technology in business printing delivers breakthroughs in speed, cost, and reliability beyond the capabilities of laser[4] or conventional inkjet technologies. HP PageWide Pro and Enterprise printers have been proven with HP business printers with HP PageWide technology printing more than 13 billion pages in the office.[5] In addition, the reliability and durability of HP PageWide business printers have been validated by third-party tests performed by Buyers Laboratory LLC.[6]

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[1] TCO comparison based on 90,000 pages for PageWide Pro and 150,000 pages for PageWide Enterprise; manufacturers' published specs for page yields and energy use; MSRP for hardware and supplies; and cost per page based on ISO yield with continuous printing in default mode with highest-capacity cartridges. Comparisons are to color business printers and MFPs $300–$1000 as of Sept 2015 and color business A4 MFPs $500–$3000 as of Nov. 2015, excluding products with 1% or lower market share as reported by IDC as of Q3 2015. More at hp.com/go/learnaboutsupplies. Based on TCO comparisons of PageWide Pro and PageWide Enterprise 400 and 500 series models.

[2] For speed comparisons, see hp.com/go/printerspeeds

[3] Energy claim based on comparisons of data reported on energystar.gov for majority of in-class color business printers $300–$800 USD and MFPs $400–$1,000 USD as of November 2015; market share as reported by IDC as of Q3 2015. Actual results may vary. Learn more at hp.com/go/pagewideclaims

[4] Compared to majority of in-class color business printers $300–$800 USD and MFPs $400–$1,000 USD as of November 2015; market share as reported by IDC as of Q3 2015.

[5] Based on internal HP research of customer usage as of Q2 2016. Includes HP OfficeJet Pro X series and HP PageWide Pro and Enterprise printers.

[6] Testing commissioned by HP and performed independently by Buyers Laboratory LLC. See Custom Test Reports: "Reliability Performance Test, HP OfficeJet Pro X551dw Printer" (August 2015), and "Comparative Reliability, Energy Consumption, Image Quality and Waste Evaluation, HP PageWide Pro 552dw vs. Competitive Laser Models" (May 2016). Visit buyerslab.com

A business printer must be ready to produce not only durable,[7] professional-quality prints with deep blacks and a wide color gamut, but must also meet demanding reliability requirements with a long service life and low intervention rates for clearing paper jams and replacing consumables. Low intervention means HP business printers have high availability to print and can spend more time printing.

Reliable printing technology

Unlike laser printers, where the photoconductor drum or transfer belt contacts the paper and is subject to wear and contamination, HP PageWide Technology printheads do not touch the paper. This contributes to keeping the printhead clean and is an element of its long service life.

HP PageWide Technology uses HP PageWide pigment Inks, which are designed for high reliability as well as durable, professional quality prints. HP PageWide pigment inks are precisely placed onto the page by more than 40,000 nozzles in HP PageWide Pro and Enterprise printers. Keeping all these nozzles ready-to-print is an essential feature of HP PageWide Technology.

Preventing ink dry-out

As with any printing technology using water-based pigment inks, HP PageWide Technology must prevent dry-out of the ink in the printhead due to water loss over time. Dry-out can either form a viscous plug of ink in a nozzle or form an ink crust blocking a nozzle. Both effects prevent normal operation, and **HP has developed printer hardware and ink chemistries to manage ink dry-out so that the user does not need to be concerned about this**.

Ink design minimizes water evaporation when the printhead is "decapped"—exposed to the atmosphere. HP's first-generation PageWide business printers, the HP OfficeJet X-series introduced in 2013, featured black pigment inks with an agent that formed a molecular-level film in the nozzles that significantly reduced evaporation. In color inks, ingredients (humectants) absorb water from the atmosphere to balance evaporation and manage dry-out.

A built-in optical system tests every nozzle on the printhead for missing drops, drop speed, and drop trajectory while drops are ejected into a container built into the removable duplexer unit. During printing, periodic spitting of a few drops from each nozzle between sheets into the duplexer keeps the ink fresh. A design goal for printhead service routines is use very little ink to keep the printhead printing reliably. A service station wipes the printhead and caps it when not printing.

To prevent ink dry-out, the printhead is automatically capped when the printer is idle. HP's automatic printhead service station as well as user-initiated cleaning cycles can recover nozzle operation, and the service station keeps ink fresh in the nozzles while the printer is plugged in and idle for several weeks. Automatic, periodic operations keep the printhead ready to print in standby and after starting up from OFF.

HP does extensive testing of printers at extremes of temperature and humidity—both for operation and storage—during product development to ensure that HP printers will perform reliably in harsh environments. One example is what HP engineers call the "Arizona Schoolhouse Test", simulating conditions where printers are turned off for a 100-day period in a very hot, dry climate. After this exposure, the printers are turned on and proper operation must be confirmed to pass the test. These harsh tests ensure that HP PageWide printers will operate over a wide range of conditions.[8] Based on third-party product testing, **Original HP ink supplies for HP business printers have been proven not to dry-out for up to 6 months of non-printing.**[9]

Note:
The printhead will be properly serviced and capped preventing ink dry-out[9] when the following simple precautions are observed:

- The printer should be turned OFF by using the ON/OFF button on the front panel, never by unplugging it or placing it on a switched power outlet.[10] This allows the printer to shut down normally giving the printhead service station time to properly cap the printhead while the printer is OFF.

- In case of a paper jam, the jam should be cleared as soon as possible. Once the paper is cleared, the printer will automatically perform the appropriate amount of printhead servicing based on the amount of time since the jam occurred. After this process completes, the printer can then be powered OFF normally from the front panel, if desired.

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[7] Prints have water, smear, light fade, and highlighter resistance. See hp.com/go/printpermanence for more details.

[8] See product data sheets for recommended temperature and relative humidity for operating and storage conditions.

[9] Based on testing of standard-capacity Original HP 932, 933, 934, 935, 950, 951, 970, 971, 980, and 981 ink cartridges by Wirth Consulting, Oct 2015, and powered off HP printers stored for up to 180 days under specific climatic conditions. Printer maintenance/servicing may be required to maintain print quality upon resumed printing. See hp.com/go/learnaboutsupplies or www.wirthconsulting.com.

[10] In case the printer needs to be moved, it should be shut down normally using the power button before being unplugged.

Reliable operation

HP's PageWide writing system produces consistent image quality over the life of the product.[11] For example, in its May 2016 Custom Test Report, Buyers Laboratory LLC (BLI) states that "In terms of consistency of output over time, BLI found that the HP model showed less variation in [print] density readings for all four colors compared to all four laser models tested."[11]

Another important element of printer reliability involves handling paper as it moves through the printer without misfeeds or jamming. Misfeeds are failure to properly pick a single sheet or properly align the sheet in the paper path; jamming occurs when the paper crinkles within the paper path, cannot be fed through the printer, and must be manually removed. Because they represent a mechanical failure to print, misfeeds and paper jams may be accounted together when assessing paper path reliability.

Paper handling includes:

- Picking a single sheet at a time from the selected input tray,
- Feeding sheets at constant speed with precise positioning through the print zone,
- Duplexing and aligning sheets for a second pass through the print zone, and
- Feeding a printed sheet into the output tray.

HP PageWide business printers use water-based pigment inks and achieve high energy efficiency by printing without a dryer (or a fuser as used in laser printers). HP PageWide inks dry quickly once in the output tray, but when printing at high ink coverage sheets may be slightly moist as they leave the print zone. Feeding moist sheets through the printer without misfeeds, jamming, or smearing, especially duplex-printed sheets, is a challenge that HP met by achieving not only a low misfeed/jamming rate overall, but also reliability on par with and better than competitive laser printers.[12]

Similar to laser printers, HP PageWide printers get their speed by printing across the page with a stationary, page-wide printhead and feeding single sheets of paper at constant speed through the print zone. This can be done much faster and more precisely than with inkjet printers using reciprocating, scanning printheads and intermittently advancing the paper a fraction of the printhead height between printhead passes.

During product development, HP conducts exhaustive tests on printers to evaluate the operation of the paper path and paper feed mechanics. The causes of any failure that cause print quality issues, misfeeds, or paper jams are studied and addressed with design modifications, and the testing cycle begins again. The result is highly-reliable mechanics that complement HP's reliable HP PageWide printheads.

The HP PageWide printhead and paper handling mechanics are shared across the HP PageWide Pro and Enterprise series printers, and were developed from designs proven by users printing billions of pages in the office with the first generation of HP PageWide business printers, the HP OfficeJet X series. HP PageWide Technology has been proven by printing more than 100 billion of pages in HP PageWide Web Presses.

Third-party test results

In addition to HP's own product test facilities, which evaluate and compare the performance of HP and competitors' products, HP commissions third-party test laboratories to use their own test methods to independently validate HP's claims and to compare the performance of HP products to competitors. All printers used for testing are purchased by the independent laboratory on the open market.

HP commissioned Buyers Laboratory LLC (BLI) to perform a suite of tests comparing HP PageWide business printers—the HP OfficeJet Pro X551dw and the HP PageWide Pro 552dw—to four competitive color laser printers.[4,6,12] Results are presented in two reports: *BLI Custom Test Report: Reliability Performance Test, HP OfficeJet Pro X551dw Printer (August 2015)* and *BLI Custom Test Report: Comparative Reliability, Energy Consumption, Image Quality and Waste Evaluation (May 2016)*. Both reports are available from hp.com/go/pagewidebusiness.

- A 500,000-page[13] test of four (4) HP OfficeJet Pro X551dw printers was performed over 6½ months printing at the maximum duty cycle of 75,000 pages/month.[14] The printers had an average of only six (6) misfeeds, or 1 per 83,333 pages, and three (3) of the printers tested had **only 2, 4, and 5 misfeeds over 500,000 pages**. Based on this performance, BLI stated: "BLI certifies the OfficeJet Pro X551dw as highly-reliable. Further, BLI feels the OfficeJet Pro X551dw's reliability is on par with or better than the laser models with which it competes."

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[11] See the results of print quality tests by Buyers Laboratory LLC: "BLI Custom Test Report: Comparative Reliability, Energy Consumption, Image Quality and Waste Evaluation" (May 2016).

[12] Test suite of competitive color laser printers included Brother HL-L8350CDW, Lexmark CS410dn, Ricoh C320DN, and Samsung ProXpress C2620DW.

[13] Buyers Laboratory uses the term "impression" to represent one printed US Letter A page.

[14] From the Buyers Laboratory LLC report on the HP OfficeJet Pro X551dw: "…daily test usage is designed to replicate real-world use over an eight-hour workday, and as such includes a mix of simplex and duplex modes and a mix of short, moderate and long run lengths, and on/off cycles, throughout the day."

- In the May 2016 Custom Test Report, BLI notes that two (2) of the four (4) HP OfficeJet Pro X551dw printers used in the 500,000-page test (August 2015) "**have produced 750,000 impressions** with little more than regularly scheduled maintenance, which is the equivalent of almost 10 and a half years of use under typical conditions mid- to high-volume small workgroups (assumes the maximum average monthly page volume of 6,000 impressions). The other two (2) models have reached 700,000 impressions, but are in need of scheduled maintenance." Furthermore, BLI stated "…the volume produced by the HP models in this test exceeds the rated engine life of the comparable laser models in our database for which this info is available."
- For the May 2016 Custom Test Report, BLI performed a 150,000-page test over 40 business days that simulated real-world use conditions for two (2) HP PageWide Pro 552dw and two (2) each of four (4) color laser competitors.[12] Both misfeeds and failed toner/ink cartridges were tracked. Together, the HP PageWide Pro 552dw printers had three (3) misfeeds and no cartridge failures compared to the best competitive result for a color laser printer of two (2) misfeeds and two (2) failed toner cartridges.

Low intervention rates

Low intervention rates mean less time refreshing the printer's consumables and more time that the printer can be printing, is ready-to-print, and can complete long jobs without interruption to add paper or replace cartridges.

HP PageWide Pro 477dn and 477dw printers have a 1,050 sheet input capacity; the 577dw and 577z printers have a 1,550 sheet capacity. HP PageWide Enterprise printers can have up to 2,050 sheet input capacity with optional Paper Trays. This compares to the 800 – 1,100 sheet capacity of the competitive color laser printers tested by Buyers Laboratory.[12]

Original HP PageWide cartridges offer high page printing capacity: standard Original PageWide Cartridges deliver ~3,000 pages (CMY) and ~3,500 pages (K); Extra High Yield Original PageWide Cartridges deliver ~13,000 pages (CMY) and ~17,000 pages (K).[15] Compare this to color cartridge yields between 3,000 and 6,600 pages and black cartridge yields between 4,000 and 7,200 pages for the competitive color printers[12] according to the May 2016 BLI Custom Report on the HP PageWide Pro 552dw.

Considering the total consumables used by the eight printers over the 150,000 page test, the HP PageWide Pro 552dw required only **37 cartridge and two (2) other components** to be replaced compared to **93 to 173 cartridge and component** replacements required by the competitive color laser[12] printers. HP PageWide business printers significantly lower the impact of printing on the environment.[16]

Summary

HP PageWide Technology delivers the professional-quality, long service life, and low intervention rates that are essential requirements for a business printing solution.

Water-based pigment inks produce high black density and a wide color gamut, but they can evaporate from the printhead causing print quality defects if the printhead is not properly serviced. An automatic service station tests every nozzle on the printhead and performs wiping and capping functions that can recover nozzles with weak or missing drops and prevent dry-out both while the printer is operating and during idle periods. The user does not need to be concerned with printhead dry-out because HP PageWide business printers prevent it automatically. In case of a persistent streak in the output, the user can activate built-in automatic printhead cleaning cycles to recover print quality.

Independent laboratory testing of HP PageWide business printers against laser competitors[12] have demonstrated paper jam and misfeed reliability on a par with and exceeding lasers. HP PageWide business printers in third-party tests have exceeded 700,000 pages under typical use conditions with little more than regularly scheduled maintenance.

HP PageWide business printers reduce intervention rates to offer high printing availability and reduce the time staff spends replacing paper and cartridges. Large built-in input tray capacities and optional additional paper trays along with a range of cartridge capacities tailor HP PageWide Pro and Enterprise printers to your monthly duty-cycle needs and provide a growth path to accommodate higher printing demands in the future.

Proven in service by printing billions of pages in the office, HP PageWide business printers are a dependable, productive, and cost-effective printing solution for your workgroup.

Learn more at
hp.com/go/pagewidebusiness

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[15] HP 976Y Extra High Yield Cartridges are available for the HP PageWide Pro 577dw and 577z Multifunction Printers.
[16] See HP Technical White Paper "Conserve resources without sacrificing performance", 4AA6-1482ENW, July 2016, Rev. 2