

MFP Network Printing Productivity

Understanding Conflicting Network Printing Productivity Claims

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Office Proving Ground

MFP Network Printing Productivity

What impacts productivity?

Q: What is the purpose of this document?

A: The purpose of this document is to discuss the elements that impact network office printing performance and to also provide testing recommendations.

Q: Rated Speed; Vendor Claims; Consultant Test Reports — all with different results! Confusing?

A: If you look at product brochures, advertising claims, and third-party test results, you are probably confused as to why there is such a variance in productivity results for the same product.

Historically, the rated copier speed was very close to the device's actual speed. With printing, however, there are many factors that affect a device's performance and they often create a large gap between a device's rated speed and its actual speed — especially in busy office environments.

Industry-standard rated speed can be determined by placing an original on the device platen, selecting 100 copies and pressing start. After the first page reaches the output tray, a certain number of pages will be produced in the next sixty seconds. For example, a device with a rated speed of 50 pages per minute (PPM) will produce 50 pages in the next sixty seconds after the first copy is produced. However, when printing documents, a device with a rated speed of 50 PPM may only achieve 50 % of its rated speed.

Q: What do the industry consultants say?

A: There are several independent consulting companies that perform print productivity testing and analysis of multifunctional systems. Each company has its own test methodology, and because of this, each vendor ends up with different test results for the same product. The test results are still accurate, but may vary because each company uses a different test suite. In lieu of commenting on each company's test suite and methodology, we will discuss the factors affecting test results that should be considered when reviewing information about a device's performance.

Q: What impacts productivity?

A: There are two key areas that impact productivity:

1. The types of documents being printed

Are documents primarily stapled, unstapled, or a mixture of stapled/unstapled output?

- a. Are the documents primarily small (i.e., 1, 2, or 3 pages) or large?
- b. Is printing done in a production environment (long run lengths, multiple sets) or office environment (typically small documents with very short run lengths)?
- c. Are documents simple or complex (i.e., containing embedded graphics)?
- d. What are the primary printed applications (i.e., Microsoft Word, PowerPoint, Excel, email notes, PDF files, etc.)?

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What impacts productivity? (cont.)

e. In the case of color-capable multifunction systems, what type of engine is used (i.e., four pass vs. single pass), and is there a significant difference between the color speed and the monochrome speed?

f. Does the color device frequently pause in order to calibrate, replenish toner, or perform other system checks?

2. The workgroup size

a. How many users are printing to the device (i.e., do you have a small workgroup of 3 – 4 people or larger workgroup of 10 or more people)?

Let's now look at how each of these factors affects productivity.

Q: What is the impact of stapled and unstapled output?

A: A critical factor in determining the effectiveness of a device is to see how it performs with a mixture of stapled and unstapled output. Although some devices can effectively print documents that are either stapled or unstapled, the office environment usually has a combination of jobs that contain both stapled and unstapled output. For example, you may have a one-page email document followed by a stapled attachment. With the finisher being the most commonly ordered accessory for multifunction devices, it is important to understand how a mixture of stapled and unstapled output impacts productivity. Chart 1 and Chart 2 illustrate the productivity advantage of Xerox devices (shown on right).

A simple test comprised of six, three-page documents will illustrate the impact of stapling.

1. Pause the print queue. At the PC that you will use for the job submission, select "start", select "Printers/Faxes", right click on the desired printer, and select "Pause Printing". (This process is for Windows XP users. Other operating systems may vary).
2. Send three stapled documents to the paused printer followed by three unstapled documents.
3. Release the paused print queue and record the amount of time it takes to print the six documents.
4. Pause the printer again.
5. Using the same documents, send the stapled job to the paused printer followed by a three page unstapled job. Repeat the process until you have the six jobs in the queue, with every other job stapled followed by an unstapled job.
6. Release the paused printer and record the amount of time it takes to print the six documents. Although you may assume that the productivity of the systems will be the same for either all unstapled documents or in the mixed staple/unstapled environment, you will likely see significantly different results. You may see more than a **50% reduction in productivity** when doing this simple test, depending on the system that is being tested.

We tested a Xerox WorkCentre rated at 45 pages per minute vs. a competitive 45-PPM system. The results of the testing for the Xerox and competitive system are shown on the right. You may be surprised to know how much the productivity can be impacted when your jobs are a combination of stapled and unstapled jobs!

Chart 1: Xerox rated speed of 45 PPM

Note that the Xerox print speed did not vary significantly when printing the unstapled, stapled, or mixed output.

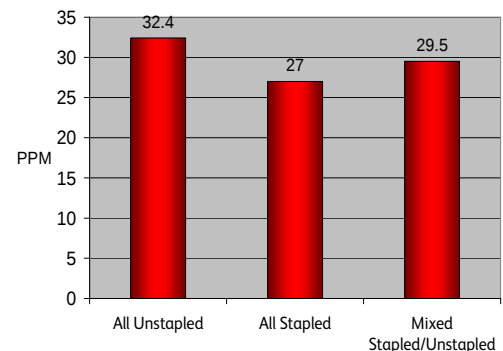
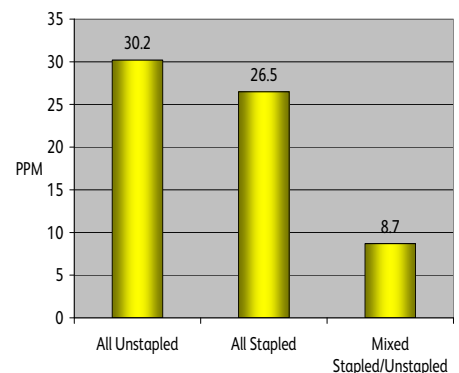


Chart 2: Competitive device rated speed of 45 PPM

The competitive vendor produced the jobs at a low of 8.7 PPM to a maximum of 30.2 PPM. Simply mixing the output reduced the productivity by more than two thirds. A busy office environment, printing documents that have both stapled and unstapled output, will be significantly impacted when job output is mixed.



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What impacts productivity? (cont.)

Q: Why is the size of a document important?

A: Device productivity is often impacted when printing a large number of small documents, as typically found in the office environment. With many competitive systems, there is a noticeable delay between print jobs, which significantly impacts the device's productivity.

Q: Why is there a difference in productivity between an office environment and a production environment?

A: In a production environment, you generally have longer run lengths than in the office environment, resulting in the printing of multiple sets. As the number of sets increases, the productivity of all systems will also increase.

Several years ago, you may have created multiple sets of documents for a meeting. Today you may send out the document electronically with each user printing a single set of the document to take to the meeting. Also, when you print a mail note, memo, or report in the office environment, you generally only print a single set of the document. In many cases, we have gone from print and distribute to distribute and print. Instead of multiple sets we are producing individual sets. In the office, where there are a lot of jobs being printed with one or only a few sets made, the system may achieve only a fraction of its rated speed.

Q: How does document complexity impact productivity?

A: All documents must be prepared for printing. This starts at the PC where a Page Description Language (PDL) is created and then sent to the device. At the device, the print controller creates a raster image with the appropriate commands such as staple or duplex, and assigns appropriate fonts and document data. The raster image can now be processed and printed by the device. As the jobs become more complex, such as a PowerPoint document with embedded graphics, the process takes longer because there is more data that must be analyzed and prepared for printing.

Generally, systems with more powerful print processors and memory will create the raster image faster than a slow processor. Some systems will also allow the print controller to Raster Image Process (RIP) one job while another job is being printed. When the previous job finishes printing, the next job is already prepared for printing, reducing time between jobs. Systems that do not RIP documents while printing other documents will have reduced productivity because the system may have to wait for the next job to be processed before printing it.

Q. With color MFPs, why does the engine type make a difference?

A: There are primarily three types of engines that are used in color MFP and printer devices. A four-pass color engine's productivity (capable of printing, for example, 20 pages per minute [PPM] for black text but slowing to 5 PPM when layering black, cyan, magenta and yellow for color jobs) will be greatly affected if a document has color and monochrome pages mixed throughout the job.

The second type, a single-pass engine (lays the color and black toner down in one pass) will handle a mixed color and monochrome document better than a four-pass engine because it does not have to pass the pages through the system multiple times.

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What impacts productivity? (cont.)

The third type of engine is a hybrid of single-pass and four-pass. These engines have the black toner separate from the color toners. When a monochrome-only page passes through the system the color toners are "disengaged" from the print path. However, if a document has color pages mixed in it, the color toners have to be "re-engaged" into the print path so the color can be added to the page. Often this process of engaging and disengaging the toners can take anywhere from 30 seconds to a minute to occur. Now imagine this having to happen multiple times for one job.

Q: Why are job types important?

A: Job types will often vary by length and/or complexity. For example, PowerPoint documents tend to be longer than an email note or short memo. If you have a majority of short jobs, the performance may be affected in two ways. There may be reduced productivity because the system does not effectively handle a larger network queue created by the series of smaller jobs. Longer jobs will also allow the system to focus on printing the job rather than managing the job queue, resulting in increased productivity. The complexity of the jobs may also vary by job type, which can affect productivity.

With a color system, the amount of color within a job affects performance. Many competitive color devices have to pause to calibrate, adjust the fuser temperature, or replenish the toner if the job contains a lot of color. These pauses can take up to two minutes to complete, and often happen in the middle of the job.

Q: Why does workgroup size make a difference?

A: An effective multifunctional system can reduce or eliminate expensive personal or small shared printers. The system becomes even more cost effective as the size of the workgroup increases.

Office printing activity occurs in peaks and valleys. For example, first thing in the morning is often a time of heavy printer usage because staff members are printing email messages, attachments, and other documents in preparation for the day's activities.

Therefore, MFP performance testing should replicate the busy office environment where multiple users are printing documents at the same time. Testing under such conditions evaluates the effectiveness of a device's network controller and its ability to manage the print queue, and should answer the following questions:

- How quickly can the device RIP the next document in the queue while printing the current job?
- Does the MFP minimize the time between print jobs or does it cycle down between jobs?

A small workgroup may have different test considerations. For example, a device shared by two or three users will not exhibit the same types of problems associated with multiple jobs in the queue as will a MFP in a busy workgroup environment with heavy print demands.

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What impacts productivity (cont.)

To test an MFP's small-workgroup capabilities, it is important to again replicate your office's typical types of print jobs. Testing the time it takes for the device to produce a single job may also be important. In this case, a simple "Click to Clunk" test may suffice, whereby you print a single job and determine how long it takes to print.

Q: Why are separator or banner sheets important?

A: A banner or separator sheet is a separate piece of paper that the printer or MFP inserts between print jobs for easy identification of individual jobs. Separator sheets are critical when supporting a large workgroup, making it easy for users to quickly find their print jobs and avoid reprinting, which increases costs and decreases productivity.

Q: How will using a separator or banner sheet affect productivity on a Xerox device?

A: Xerox devices provide virtually the same performance with or without a banner sheet. In all the systems that were tested, Xerox systems were significantly faster than competitor devices without banners, ranging from 1.4 to 1.9 times faster than the respective competitors. For example, Chart 3 (shown on right) compares a Xerox 45 PPM device versus two competitive devices that also had a rated speed of 45 PPM. All three systems used a test suite that represents a mix of jobs typically printed in an office environment.

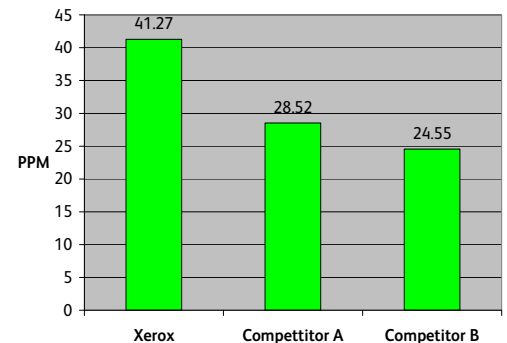
Q: What test suite should I use for my office?

A: Use documents that you print daily within your organization. We also advise that you replicate your office environment in order to determine how your particular job mix affects the device's productivity. For instance, if you have a large workgroup, insure that you have multiple jobs in queue, representing the busy office environment. If you have stapling requirements, insure that you have a mix of both stapled and unstapled jobs

If you are testing a color MFP device, be sure to use a document that requires the system to switch between color and black-and-white pages to see how the engine handles it. Also, add pages that are heavy in color to see if the system can keep up with the demand without having to pause.

If you would like to use a test suite of jobs that have already been prepared, your Xerox representative can provide the suite to you. It is designed to represent the busy office environment with a variety of different job types.

Chart 3: Banner-Page Printing Performance

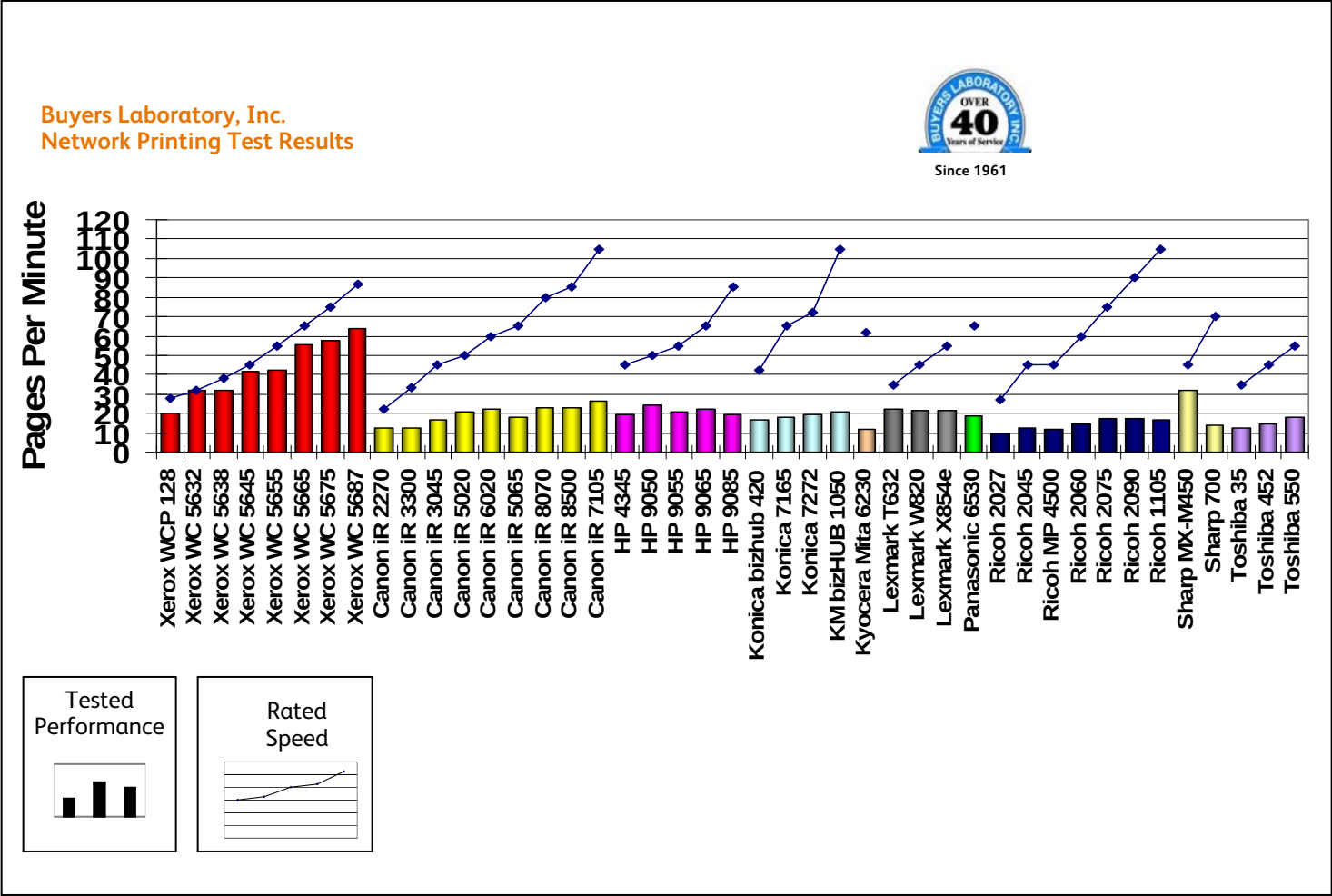


Most competitor systems do not have a system-generated banner page, so they rely on the driver to send an additional separator sheet file that the printer must also process — negatively impacting productivity.

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What impacts productivity? (cont.)

To understand how products perform in this environment, Xerox Corporation commissioned BLI who determined test methodology and developed a test suite that includes banners with a mix of jobs that are typically printed in an office environment. The results of the testing for this BLI test suite are seen below. Note that as rated speed of the Xerox system increases, so does the corresponding performance. In the case of the competitive systems, the tested performance leveled off and did not increase with the corresponding rated speed.



Note: Print productivity was conducted by Buyers Laboratory Inc. (BLI), with each product operating in default mode and resolution set at 600 dpi. Multiple jobs from a BLI test suite were sent in series to each device with output consisting of a mix of single and multiple stapled sets with a banner page for each job. The order in which jobs were sent was randomly selected and was the same for each model.

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Summary

Not all systems are created equally! The Xerox WorkCentre® is optimized for the busy office environment. Xerox has been producing printing systems since the 1970's. The experience with our printing systems and DocuTech® solutions taught us how to maximize the systems' productivity. Multiple jobs continue to print with little or no hesitation between jobs. We strive to keep the paper path full at all times, resulting in output speed that approaches the rated speed of the device.

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