

HP PageWide Web Presses: Obtaining long printhead life



The useful life of HP printheads used in HP PageWide Web Presses is influenced by many factors including design and manufacture, storage and use, printing conditions, media type, press condition and maintenance, operator practices, time-in-use, and others. This document is intended to raise awareness of factors that influence printhead life so you can better understand how your actions may—or may not—serve to obtain the longest life from your HP printheads.

Printhead life

Printhead life is generally measured by time-in-use (hours) and the volume of ink (liters) delivered. Used with HP A50 Pigment Inks in HP PageWide Web Presses, and maintained and operated according to HP guidelines, HP printheads produce reliable and consistent print quality over a long operating life. HP printheads are a consumable, and even under ideal conditions, they will eventually wear out—either from time-in-use or liters printed—and will require replacement.

An HP PageWide Web Press is a complex system, and printhead health and life expectancy is influenced both by obvious and some seemingly-unrelated factors. For example, keeping the ink delivery system free of contaminants should be obvious to all users, while setting proper tension in the web and ensuring web alignment through the print zones may seem unrelated. In the latter case, improper adjustment and settings could cause the web to wrinkle and strike and damage the printheads.

Printhead replacement is generally required under the following conditions:

- A failure is detected by the press or press operator;
- An excessive number of nozzle-outs are detected by the press or press operator through the user interface—for example, the HP Quick Vision System—or from examination of printed output;
- Print quality no longer meets the requirements of the application and print customer.

Different users and applications have different expectations for print quality: those demanding the highest print quality may replace printheads earlier than another user with lower quality and production cost requirements.

As a general principle, the longest printhead life will be obtained when printheads and ink are stored, handled, and used in accordance with HP guidelines and “use-by” dates, and when equipment—the HP PageWide Web Press and its associated components and accessories—are maintained and operated according to recommended practices and maintenance schedules in the operator and service manuals supplied by HP and accessory manufacturers.

How to use this document

Years of customer production experience with HP PageWide Web Presses have taught HP R&D and service engineers that some conditions and situations expose printheads to hazards that cause degraded performance and even premature failure. This document summarizes much of those learnings, and it is intended to provide you and your press operators with information that can help to give you long and reliable service life from each printhead in your HP PageWide Web Press.

Important

By presenting recommendations and guidelines in outline form, the information in this document is designed to be highly-accessible to you and your press operators. This information is intended to direct your attention to—but not take precedence over or replace—instructions and guidelines in operator and service manuals supplied by HP and accessory manufacturers. Those documents remain your primary references for safe, productive, and reliable operation of your HP PageWide Web Press.

Basic considerations

These are the basic considerations for printhead use:

- HP printheads are intended to be used in an HP-approved printing system that has been installed, configured, and maintained according to HP specifications and within an environment that meets all HP site preparations guidelines.
- Printheads must be used in combination with HP inks delivered from the HP-provided ink delivery system (IDS) that is properly maintained to ensure inks are filtered, degassed, and pressurized according to design specifications.
- To deliver the greatest amount of ink prior to printhead replacement, nozzle usage is ideally distributed evenly across the printhead. That means that all nozzles accumulate approximately the same number of drop ejection cycles without having some nozzles used heavily with the rest remaining (mostly) idle over whitespace on the web.
- Printheads should be used and serviced according to HP guidelines on a regular basis.
- Users should evaluate all media options for print production including inkjet-treated, in- and near-line priming solutions, and ColorPRO papers to obtain the best press and printhead performance and job production economies.

Many print quality issues can be avoided through proper press maintenance, proper handling and storage of printheads and ink, care of the press environment, and proper press settings. Examples of common issues that can be avoided include:

- Printhead contamination from media, unintended exposure to HP Bonding Agent, foreign material or fibers blocking nozzles;
- Physical damage to the printhead from contact with the web, objects, or surfaces;
- Print degradation due to dried out or plugged nozzles following excessive time uncapped and unused;
- Air ingestion into the nozzles due to improper storage or handling, or poor press maintenance;
- Out of date press hardware and firmware (i.e., PCR—Press Code Revision).¹

Factors affecting printhead life

The following topics discuss operating conditions and procedures to illustrate best practices and provide basic guidance. This discussion should help press operators understand what affects printhead life and how to get the best results.

Press maintenance

Proper press maintenance and adjustment is critical to maximizing printhead life. Conversely, inadequate maintenance or improper press adjustments can directly reduce printhead life or cause premature failure. If you suspect you are experiencing shorter printhead life than expected, ensure all regular press maintenance items have been carried out as specified in the HP operator and service manuals and ensure press settings have been verified and adjusted properly.

Consult with HP Service and Support to determine if any printhead performance and life issues you experience can be resolved by hardware and/or firmware updates to your HP PageWide Web Press.

The following list summarizes conditions and operating procedures that can affect printhead life. Recommendations and guidelines are provided where indicated:

- Press maintenance prompts on the user interface (“GUI”):
 - Resolve in a timely manner.
- Press Alarms:
 - Resolve in a timely manner.
 - Pay special attention to web wipe cassette warnings and print bar motion/servicing alarms.
- Aerosol ducts, air extraction system, and canister filter:
 - Check and regularly clean; replace as required.
 - Ensure sufficient airflow is maintained.
 - Remove ink accumulation to prevent drips.

¹ Check with HP Support to verify whether applicable updates are available.

- Printbars:
 - Regularly clean the face of printbars according to instructions.
 - Do not contaminate printheads with any commercial cleaners, or ink or dust residue removed from the face of the printbars. Only deionized water (“DI water”) may be used as a cleaner in proximity to printhead nozzle plates.
 - Verify printbar heaters are functioning correctly (in some models).
 - Visually inspect rubber printhead caps to ensure they are properly installed.
 - Each rubber cap should be aligned to the correct printhead offset direction (according to positive or negative printbar offset) and should lie flat.
 - Clean caps regularly and inspect for paper dust, foreign matter, and ensure the vents are not plugged.
 - Verify printbar grounding/electrical isolation integrity to be sure that there is no electrical noise or signals on the ground lines (labeled “Dcom”²).
- Press paper path:
 - Check to ensure that there are no wrinkles on the web.
 - Check for correct tension settings.
 - Check for an imbalance in ink coverage in the cross-web direction.³
 - Web rollers, especially within the print zone:
 - Keep clean and free of buildup or foreign material such as ink, adhesive tape, etc.
 - Nip rollers:
 - Verify that they are in good condition.
 - Verify that they are in proper position away from media edges.
 - Verify that they are in proper alignment.
 - Load cells are each calibrated and providing consistent feedback for tension control.
 - Avoid waves in heavier-weight papers that can crash printheads when the printbars are in the print-ready position.⁴
- Web wipe cassettes:
 - Check and replace when approaching empty.
 - Properly seat within each servicing shuttle.
 - Check that ink is visible on the surface of the web wipe roll after servicing is complete.
- Ink delivery system (IDS):
 - Verify that no ink lines are kinked, pinched, or otherwise restricted.
 - Change ink filters regularly according to required schedule.
 - Ink degas modules:
 - Maintain in good condition.
 - Change within periods specified by maintenance manuals.
 - Verify that there is no ink leaking past the degas modules towards the vacuum pump – replace module if leakage noted.
 - When changing degas filters, verify no blockage within the manifold where individual vacuum lines join to the source vacuum line.
 - Verify IDS venting (T2XX models) is not plugged.
 - Verify that ink pressure to printheads is within specifications.
 - Verify that the latest press and IDS hardware and firmware (PCR) updates are installed.
 - Verify that IDS solenoid valves are functioning as expected.

² Dcom stands for DC common. If you detect a short-circuit between Dcom and ground, then there is a problem.

³ If there is significantly higher ink coverage on one side of the web compared to the other when using lighter-weight paper, the difference in stretch between high- and low-coverage areas can cause wrinkles. Under some circumstances, tension adjustments may reduce wrinkling, but tension adjustment is not always effective for very light-weight papers.

⁴ While the press is idle and loaded with heavy/stiff paper, the paper can take a set where it is wrapped around rollers. This produces a wave in the paper. From the high wrap rollers before the print zone, the wave can be large enough to cause printhead crashes when the web is fed under printbars in the print-ready position. This situation can be avoided by not using *Print on ramp*. Not using *Print on ramp* allows the waves to move through the print zone while the press ramps to the set speed. After set speed is reached, the printbars move to the print-ready position.

- Press room environmental facilities must be maintained and function according to guidelines for temperature, humidity, etc. as specified in the HP site preparation and operator manuals.
- Customer-furnished exhaust fan and ducting must maintain proper negative pressure to dryer and aerosol exhausts.
- Adjust dryer vents according to specifications.
- Verify that ionizer bars are clean, powered, and function properly.

Important

Unapproved modifications to your HP PageWide Web Press and failure to perform scheduled and as-needed maintenance may affect your warranty.

Storage and handling considerations

The following recommendations should be followed for the use and handling of HP printheads and ink supplies.

- Printheads and ink barrels must be shipped, stored, and used according to HP guidelines.
 - Storing printheads in an improper orientation can cause performance issues and, in the worst case, premature failure.
 - Printheads must be handled with care at all times.
 - Avoid impacts and striking exposed nozzles against any surface.
 - Keep the printheads in their protective plastic shipping cap whenever not installed on the press.⁵
 - Keep printheads in the shipping box (arrow facing UP) or with nozzles facing UP otherwise.
 - Do not place an uncapped printhead in the nozzles-down position on any surface. Ink leakage and nozzle damage and contamination may occur.
 - Vigorous shaking of a printhead can adversely affect print quality, either temporarily or permanently, by causing air ingestion into the nozzles.
- Printheads and ink must be protected from temperature extremes and should be handled with care prior to installation on the press.
 - Pay particular attention to the required storage temperature ranges for printheads and inks.
- Open ink barrels should be treated with care to avoid contamination of the ink.
 - Clean around barrel openings to remove dust and foreign matter prior to opening.
 - Keep barrel openings covered by dip-tube and level-sensor pucks at all times.
 - Guard against any activities that could introduce foreign materials into the barrel or IDS components.
 - Do not attempt to transfer left-over or stranded ink from one barrel to another.

Press environment

The press environment on the production floor should be maintained in accordance with HP site preparation guidelines. HP PageWide Web Presses will produce more consistent results when the temperature and humidity in their environment is maintained within limits specified in the operator's manual.

- Always allow fresh rolls of media to come into temperature and humidity equilibrium with the press environment ("acclimate") before loading the roll onto the press.
 - Do not install onto the press rolls taken directly from a cold and/or damp storage facility.
 - Media that is not properly acclimated will be more likely to have wrinkles and waves that could cause contact with and damage to the printheads.
 - Consult with the media manufacturer for guidelines regarding recommended moisture content and acclimation practices. If no information is available, and roll storage and press environments are significantly different, consider allowing a fresh roll to acclimate to press room conditions for 24 – 48 hours before loading onto the press.
- Fibers, paper dust, and other contamination from the press environment can be drawn into the print zones by the web. This can contaminate and block printhead nozzles causing missing dot rows down the web and/or drips of ink onto the web.
 - In case of drips, the press should be stopped and excess ink removed from the printbars and aerosol ducts.
 - In case of visible print quality defects, stopping the press and performing a service cycle should be considered.

⁵ It is a good practice to retain each printhead's shipping cap. To prevent cross-contamination between inks and by HP Bonding Agent, mark each cap with an indelible marker indicating the original ink color—i.e., C, M, Y, K, or BA—and store the caps in a clean and dust-free environment, such as air-tight plastic bags.

- It may be necessary to install a web cleaner to reduce contamination reaching the print zones in some environments and for some media that are prone to producing paper dust
 - For example, the use of perforated media may require a web cleaner.
- Print zone temperature control:
 - Print zones should not be blocked preventing the release of heat generated by the press.
 - Heat sources and airflow—including hot air, chilled air, or lamps producing radiant heat—should not be directed towards the print zones.

Press settings

Press settings must be appropriate to each job and media type. Some settings include control parameters that are consistent from job to job. Some settings may require adjustment to optimize performance for a particular job and media combination. Saved profiles allow you to easily store and recall settings for repeating media/job combinations.

Proper press settings will help prevent wrinkles in the web and ink cross-contamination between printheads. Cross-contamination can be caused by direct contact between the web and the printheads, Bonding Agent drips, Bonding Agent aerosol migration, condensation on printbar surfaces, paper tension too low or too high, and paper path misalignment.

Press settings that can impact printhead nozzle health and printhead life include:

- Tension set-points for the unwinder, in each print zone, and for the rewinder or in-line finishing equipment.
- Dryer settings.
- Aerosol system: enabled and adjusted properly.
- Nip roller pressures and positions.
- Steering unit settings.

Uneven nozzle usage

The useful life of a printhead—in terms of liters of ink delivered—is generally longest when all nozzles are used evenly. Unbalanced nozzle use—where some nozzles are used much more than others—affects total delivered ink before wear-out and replacement. For example, if 4 out of 5 die on a printhead are printing normally and one die is idle most of the time, then the total amount of ink delivered before the printhead wears out is $4/5^{\text{th}}$ (80%) that of a printhead that has even nozzle usage.

Factors that lead to uneven nozzle usage across a printhead include

- Repeated production of content where a group of nozzles only addresses whitespace—where no dots are printed—either inside the image frame or beyond the width of the frame or web. In extreme cases, the only ink printed from these idle nozzles (within the width of the web) is in quality bars, in spit bars, in spit-on-page servicing, and during printhead service cycles.
- Repeated production of high-density areas down the web by a specific group of nozzles. For example, large solid area fills printed in the same place in every image frame.
- Printheads installed at the ends of the printbars where nozzles extend beyond the printable width of the media.

Nozzles (and printhead die) that are unused for extended periods of time may degrade due to extended exposure where the nozzles are both uncapped and unused. This is an issue for nozzles extending outside of the image frames or beyond the width of the web. For an example of the latter case, consider the case where 30-inch media is run on a 42-inch press.

Print density may vary as a printhead reaches end of life. At some point — especially for jobs requiring highest quality levels—printheads will have to be replaced when some or all of the nozzles are approaching end-of-life and density variations can no longer be corrected.

Extended periods when the press is idle

If a press will be idle for an extended period of time—more than 7 days—there is risk of degrading printing performance as the ink delivery and writing system components are left unused. For example, water vapor is slowly lost from the printhead caps and ink supply lines and air slowly diffuses into IDS components.

It is best to avoid long periods where the press is idle, but if this not possible, then guidelines for extended shutdown/storage long-term storage should be followed. These are described fully in HP operator and service manuals and generally include the following procedures:

- If the press will be idle for more than two weeks, then remove/reinstall printheads.⁶
 - Remove printheads from the press and cap each printhead with its shipping cap.⁵
 - Ensure that the shipping cap was used for a printhead with the same color(s) of ink to avoid ink cross-contamination;
 - Ensure during handling that each printhead is not uncapped for more than three (3) minutes.
 - Store the capped printhead with nozzles facing UP and under the specified conditions of temperature and humidity.
 - Reinstall printheads prior to next production job and run two or three (2 or 3) Startup Calibrations in color mode, with Bonding Agent enabled, and with “Med-High” or “High” ink density selected. This procedure provides a convenient way to ensure there is fresh ink in the nozzles and make the press ready for printing.
- Once or twice a week, print a short job to keep printheads and IDS components refreshed.
 - Run two or three (2 or 3) Startup Calibrations in color mode, with Bonding Agent enabled, and with “Med-High” or “High” ink density selected.

Summary

HP rigorously tests printheads under controlled conditions to evaluate printhead performance and life under a variety of operating and use conditions. Actual conditions may vary from HP’s test conditions and could result in different printhead life. HP uses printhead usage and failure information under production conditions to develop recommendations operators can use to get the longest operating life from their printheads. This document summarizes those recommendations.

Most of these recommendations are easy to understand and implement, and they follow from best practices in press maintenance and operation and in the care of printheads and the ink delivery system.

HP printheads are a consumable, and they will eventually reach the end of their useful life and require replacement. By understanding conditions that can reduce printhead life and cause premature failure, HP PageWide Web Press users can get the most operational life from their printheads.

⁶An alternative to removing printheads is to “print a short job” below.

