Designation: F2734 – 08

Standard Practice for Testing the Shelf Life of Ink Jet Printer Cartridges[1]

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1. Scope

1.1 This practice describes a practical procedure to help determine the shelf life confidence of a sample ink jet cartridge in a short period of time. This practice uses an accelerated aging test based on the Arrhenius principle which states that for every 10°C increase in temperature there is, approximately, a two times rate increase of a chemical reaction.

1.2 This practice consists of comparing the ability of an ink jet cartridge to print after exposure to elevated temperature as compared to a reference ink jet cartridge, such as an OEM (original equipment manufacturer) ink jet cartridge.

1.3 This practice can be used to evaluate the effectiveness of the overall production of remanufactured or refilled ink jet cartridges.

1.4 To confirm the results of accelerated aging, real-time aging should also be conducted.

1.5 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

1.6 *The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

F909 Terminology Relating to Printers

F1174 Practice for Using a Personal Computer Printer as a Test Instrument

F1857 Terminology Relating to Ink Jet Printers and Images Made Therefrom

F1942 Practice for Creating Test Targets for Determining the Ink Yield of the Imaging Supplies Used in Ink Jet Printers

F2555 Practice for Determining Page Yield of Ink Jet Printer Cartridges—Continuous Printing Method

3. Terminology

3.1 *Definitions*—See Terminology F909 and F1857.

4. Summary of Practice

4.1 This practice describes a method to compare the shelf life of a sample ink jet ink cartridge as compared to a reference ink jet ink cartridge by exposing each cartridge to elevated temperatures and comparing their ability to function.

4.2 Based on previous elevated temperature testing within the industry, exposure to 60°C for 21 days is roughly equal to a shelf life of one year. This statement is for guidance as this test procedure is more comparative than predictive. It is not confirmed that there is a linear relationship between the number of heating days to shelf life (that is, 60°C for 42 days may not be equivalent to two years shelf life).

5. Significance and Use

5.1 This practice can be used to determine the stability and performance of ink jet ink when exposed to elevated temperatures in an ink jet cartridge.

5.2 This practice can be used for the evaluation of an OEM or other reference ink jet cartridge compared to a corresponding remanufactured, or refilled, or other sample ink jet printer cartridge.

5.3 This practice is applicable to all ink jet cartridges, whether single or multicolor.

5.4 This practice can be used to assess design goals of manufacturers of ink jet printer cartridges for ink capability, ink filling, and packaging effectiveness.

5.5 This practice may be used for research and development, and for quality acceptance evaluation.

6. Interferences

6.1 Print testing should be performed at a controlled temperature and humidity within the operating range of the printer. All equipment and materials should be conditioned in the test atmosphere for at least 24 h prior to testing.

6.2 Test printers should be in good mechanical and electrical condition. Any printer failures can invalidate the test.

[1] This practice is under the jurisdiction of ASTM Committee F05 on Business Imaging Products and is the direct responsibility of Subcommittee F05.07 on Ink Jet Imaging Products.

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

6.3 Cartridges must be in good condition. Damaged circuits, electrical failure, missing parts, improperly assembled parts, and leaking ink will cause poor results.

6.4 If printhead tape is used, it should be of a quality acceptable for ink jet cartridges.

6.5 The quality of the ink jet ink used may yield poor results.

6.6 When printing black, some printers with all-in-one cartridges will underprint the black print with cyan, magenta, and yellow even if "black only" print is specified. Therefore, because the color cartridge used during black print testing is actually printing, the print result will not be a true black cartridge print. A color cartridge that does not print should be used for these printers.

6.7 If a higher heat than recommended is used, cartridges and/or packaging, may prematurely fail due to damage to cartridge components.

6.8 When placed in the oven, the orientation of packaged cartridges should be comparable to the packaging of the corresponding reference cartridge. However, other packaging configurations can be tested for effectiveness.

7. Equipment and Materials

7.1 *Ink-jet test printers,* suitable for testing purposes, following the guidelines as stated in Practice F1174.

7.2 *Reference cartridges,* (OEM printer specified) for a comparative test.

7.3 *Test target and digital printing system,* complying with Practice F1942.

7.4 *Test cartridges,* designed for use in the test printer.

7.5 *Conditioned paper,* meeting the requirements of the printer. The same paper type and manufacturer should be used for all comparative tests.

7.6 *Convection oven,* capable of sustaining 60 ± 0.5°C for 28 days.

7.7 *Analytical balance,* capable of weighing to 0.1 g.

8. Procedure

8.1 Before beginning test, install a reference cartridge (OEM printer specified) in accordance with the instructions of the printer user's manual. Print a test page, either self-test or PC controlled, to ensure the test printer is working properly. (This is especially important if the test printer has never been used and uses an ink charging process.)

8.2 Weigh a minimum of 10 sample cartridges that meet internal print testing criteria, tested on properly functioning printers. Record as the start weight of the cartridges then package cartridges in accordance with customer or end-user specifications. This packaging may consist of printhead tape, a cartridge clip, bagged and boxed. The orientation of the packaged cartridge should be the same as the reference cartridge.

8.3 Place cartridges positioned in proper orientation in convection oven at 60°C along with a minimum of two corresponding reference cartridges. Using a temperature higher than 60°C could adversely affect the ink jet cartridges and/or the packaging components.

8.4 After 7 days, remove two packaged sample cartridges from oven and allow cartridges to return to ambient temperature.

8.5 Unpack sample cartridges and record weight. Compare to start weight. A drop in weight suggests packaging that is insufficient allowing ink to evaporate.

8.6 Conduct print test to determine if cartridge functions properly as compared to normal expected quality performance. If print test is acceptable continue test with remaining cartridges and repeat print testing as in 8.5 at 14, 21, and 28 days, again allowing cartridges to return to ambient temperature.

8.7 Reference cartridge print testing can be conducted after 28 days. If sample cartridges fail to have acceptable print at 7, 14, or 21 days, the reference cartridges should be tested for acceptable print at this interval.

8.8 If cartridge print quality is satisfactory, a page yield test can be conducted in accordance to Practice F2555 to compare before and after page yields.

9. Report

9.1 Test date and location.

9.2 Identification of printer used and setup conditions.

9.3 Identification of reference ink jet cartridge (OEM printer specified).

9.4 Identification of sample ink jet cartridge. This may include variables such as ink design, manufacturing process, etc.

9.5 For page yield test:
9.5.1 Test target name stating percent coverage.
9.5.2 Start and end printed pages of reference cartridge.
9.5.3 Start and end printed pages of sample cartridge.

10. Keywords

10.1 ink jet; ink jet printer; page yield; shelf life