Designation: F 2037 – 00

Standard Practice for Predicting the Lifetime of Ink Jet Prints Stored in Dark Keeping Conditions in Typical Office Environments[1]

This standard is issued under the fixed designation F 2037; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This practice describes an accelerated procedure intended to predict the lifetime of images stored in dark keeping conditions in typical office environments.

1.2 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*

D 2244 Test Method for Calculation of Color Differences from Instrumentally Measured Color Coordinates[2]

2.2 *ANSI Standards:*

ANSI/NAPM IT9.9–1996 Stability of Color Photographic Images—Methods for Measuring[3]

ANSI/PIMA IT9.24–1997 Arrhenius-Type Predictions—Test Method[3]

Limitations of Accelerated Image Stability Testing[4]

3. Terminology

3.1 *Definitions:*

3.1.1 *ink jet media, n*—recording elements used by ink jet printers to receive inks. The substrate may be paper, plastic, canvas, fabric, or other ink receptive material. The substrate may, or may not, be coated with an ink receptive layer(s).

3.1.2 *single accelerated test, n*—dark stability testing at a single set of environmental conditions, for example 50°C and 50 % relative humidity (RH).

4. Summary of Practice

4.1 Printed test samples are covered with polyethylene terephthalate (PET) sleeve[5] to simulate an album, or with a sample of the same sample type to simulate a stack of prints, and placed in foil-lined bags. Air is forced out of the bags and the bags are sealed. The bags are placed in dark recirculating forced-air environmental chambers at multiple temperatures at 50 % RH. After a predetermined color change is obtained, the test is terminated and the image life is predicted by ANSI/PIMA IT9.24–1997.

NOTE 1—The foil bags serve several purposes: they protect the samples, they prevent any outgassing from the samples from contaminating other samples in the test chamber, and they ensure contact of the PET or receiver to the samples.

4.2 The duration of the test may vary widely depending on the dark stability of the ink/media and the temperature condition.

4.3 During the course of the test, the color changes in the printed samples are periodically evaluated instrumentally. Results are compared to a control incubated at room conditions and to the same specimen prior to incubation. The color change is reported as percent retained optical density and color difference, ΔE.

5. Significance and Use

5.1 The image life of printed ink jet media in dark keeping conditions in typical office environments is pertinent to the end use of these materials. While natural aging is the most reliable method of assessing image stability, the length of time required makes this method impractical for most materials. As a result, accelerated tests often are used. This test practice is an accelerated short-term storage test that simulates long-term storage but at elevated temperatures. A room condition sample is also tracked to provide practical data. By measuring the time needed to obtain a predetermined color change at a variety of temperature conditions, the image life can be predicted using the Arrhenius method.

NOTE 2—The Arrhenius method is a predictive test based on mathematical extrapolation of high temperature tests to room temperature. In this test, long-term color changes are predicted by performing short-term tests at a series of high temperatures.

5.1.1 Since the ability of an ink jet print to withstand color changes is a function of temperature and humidity, it is important that dark stability be assessed under the conditions appropriate to the end use application. While ink jet prints may be handled and displayed under a variety of conditions, this test practice is intended to produce the color changes that may

[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.

Current edition approved June 10, 2000. Published August 2000.

[2] *Annual Book of ASTM Standards*, Vol 06.01.

[3] American National Standards Institute, Inc., 11 West 42nd Street, New York, NY 10036.

[4] S. Anderson and D. Kopperl, *Journal of Imaging Science and Technology*, 37: 363–373 (1993).

[5] Kodak Image Sleeve Cat. 160–0733.

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