

How Long Will They Last? – Part II

An Overview of the Permanence of Digitally-Printed Photographs and Applicable Accelerated Print Permanence Test Methods

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Abstract

This paper is a sequel to: “*How Long Will They Last? An Overview of the Light-Fading Stability of Inkjet Prints And Traditional Color Photographs*” presented by this author at IS&T's 12th International Symposium on Photofinishing Technology, held in Orlando, Florida in February 2002.

With the rapidly accelerating shift in worldwide markets away from film cameras and analog printing with traditional silver-halide materials to digital photography, there has been tremendous growth in the use of inkjet printers, thermal dye transfer (“dye-sub”) printers, digital minilabs employing a variety of printing technologies, and other digital output devices for printing color photographs. In an historic change that is without precedent in our industry, the great majority of color prints made by consumers in the digital age are now being printed at home, with the individual consumer making purchase decisions concerning types of printers, papers, and inks. Image permanence is now often an important consideration in deciding product suitability – and *desirability*. In the consumer's mind, even if only in a rather nebulous way, traditional silver-halide color prints are now generally used as a benchmark for evaluating and comparing the permanence of prints made with inkjet and other digital print technologies.

At the present time, unfortunately – and quite surprisingly given the importance of the issue – there are *no* ANSI or ISO Standards which can provide an answer to the consumer's frequent question: “How long will they last?”

As a result of the failure over the past 25 years of the largely industry-driven standards organizations to develop meaningful image permanence standards for either black-and-white or color photographic print materials, many manufacturers, photographic and digital imaging publications, Wilhelm Imaging Research, Inc. and other independent image permanence testing laboratories, and even individual photographers and artists have developed *their own* test methods and image-life metrics.

This often confusing state of affairs has not been without its benefits, however. Photographic image permanence has become a major competitive issue in the industry (something that was totally absent from the introduction of

Kodachrome, Agfacolor, AnscoColor, and Kodacolor in the 1930's and 1940's, until around 1980). The emotional driving force of the photographic industry has always been the desire of its customers to capture and preserve a moment in time and it has only been in recent years that the ramifications of this desire have finally started to be fully understood. In their efforts to displace traditional silver-halide and film technology in the marketplace with new digital printing systems, the electronic and computer equipment manufacturers have recognized the appeal of “longer-lasting prints” and the promotion of their more stable products has injected some very healthy competition into the worldwide imaging industry around the issue of print permanence.

As has often happened during the more than 160-year history of photography, new imaging technologies can introduce never-before-seen modes of print deterioration, and the age of inkjet and other new digital printing technologies is no exception. Never before have the issues been so complex – especially when attempting to make image permanence comparisons between multiple technologies. And never before has there been so much consumer interest in having meaningful answers to the question: “How long will they last?”

Discussed in this paper is the philosophy of permanence testing and consumer hopes (“Where do we see the problems?”); print permanence test methods; standardized environmental conditions for reporting permanence test data; and image-quality-loss metrics for the following:

- 1) Indoor light stability during long-term display.
- 2) Resistance to gas-fading (caused by ozone and other gases).
- 3) Resistance to surface abrasion (especially for matte papers).
- 4) Humidity-fastness (color change and/or loss of sharpness).
- 5) Thermal degradation and stain (dark storage stability).
- 6) Water-fastness and “wipeability” when wet.
- 7) Stability of fluorescent brighteners, if present in print paper.
- 8) Short-term color drift (especially for color-managed systems).
- 9) Resistance to contact with plasticizers in PVC plastics, etc.
- 10) Resistance to fingerprints over time after finger contact.

Tests for all of the above are necessary for the *full* characterization of the permanence of digitally-printed photographs.

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