

KODAK PROFESSIONAL ENDURA Premier Paper – A New Silver Halide Paper with Improved Color Gamut for both Portrait Social and Commercial Application

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Abstract

In Eastman Kodak Company's ongoing efforts to further improve the output quality of its silver halide papers Kodak has introduced KODAK PROFESSIONAL ENDURA PREMIER Paper. This paper was developed with new emulsion and dispersion technologies that further enhances color gamut while maintaining critical image quality attributes such as flesh tone and tone scale reproduction. These improvements allow KODAK PROFESSIONAL ENDURA PREMIER Paper to be used in Portrait Social and Commercial applications. This technical paper will review the technologies, as well as the customer benefits provided by this new silver halide paper.

Introduction

Kodak has had a long standing strategy to design photographic papers to be aligned with digital printing technologies used in the professional market. Most recently the standard professional paper in the portrait social market has been KODAK PROFESSIONAL SUPRA ENDURA VC Paper while the standard professional paper for the commercial market has been KODAK PROFESSIONAL ULTRA ENDURA Paper. Both were designed and optimized for digital printing. KODAK PROFESSIONAL ENDURA Premier continues with this strategy by offering one paper for both markets with increased color gamut and other improvements specifically related to image quality.

The product label is shown in Figure 1.



Figure 1. KODAK PROFESSIONAL ENDURA PREMIER Paper.

Product Development

The product development of KODAK PROFESSIONAL ENDURA Premier Paper was focused on customer usage of professional photographic paper in digital printers. The development team designed and built a new emulsion and a new imaging dye dispersion. Both are optimized for increased color gamut while maintaining other critical image quality attributes essential for both the portrait social and commercial markets. An accurate flesh tone, including color reproduction, is extremely important to the portrait social market while large color gamut is critical to the commercial market. Other key attributes of a professional paper that are also important to professional lab customers include printer calibration robustness, chemical process stability, and post process applications such as print mounting, retouching and other applications after printing. In addition KODAK PROFESSIONAL ENDURA Premier continues to incorporate the strong image permanence attributes of previous Endura papers. When developing the new paper, and to ensure maintenance of these critical attributes, statistically designed experiments were conducted evaluating silver, gelatin, coupler, and other chemical levels to ensure quality performance that meets customer needs. Once a prototype paper was developed we tested it with key customers so they could assess the product's performance. With this customer information we optimized the paper and delivered a customer driven professional silver halide paper for use in the portrait social and commercial markets. Product features are shown in Table I.

KODAK PROFESSIONAL ENDURA PREMIER Paper Features

Table I

Features	Benefits
<ul style="list-style-type: none"> Neutral tone scale – from highlights to shadows 	<ul style="list-style-type: none"> Accurate flesh tones
<ul style="list-style-type: none"> Exceptional high-intensity reciprocity characteristics 	<ul style="list-style-type: none"> Optimized for all digital exposing devices, CRT, LED and laser printers Optimized text fringing

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<ul style="list-style-type: none"> Advanced color coupler technology 	<ul style="list-style-type: none"> Strong, bright colors Vibrant greens, blues, yellows, and cyan Increased color gamut
<ul style="list-style-type: none"> State-of-the-art image stability* 	<ul style="list-style-type: none"> 100 years in typical home display, 200 years in dark storage 20 months for high-intensity commercial reflection display under 5000 lux

Technology

Several new technologies were developed for use in KODAK PROFESSIONAL ENDURA Premier Paper and were designed to improve several areas in the paper's performance. The first improvement was made in the paper's cyan emulsion layer. KODAK PROFESSIONAL SUPRA ENDURA VC Paper and KODAK PROFESSIONAL ULTRA ENDURA Paper used different cyan emulsions which had been optimized for the specific target market that each product served. KODAK PROFESSIONAL ENDURA Premier Paper needed to perform in both markets so a new cyan emulsion was designed that produced high density capability for commercial use and a soft lower scale that delivers excellent flesh tones and highlight detail for portrait social use. While cyan emulsion changes were made for tone scale improvements, spectral sensitization for all three color layers remains unchanged.

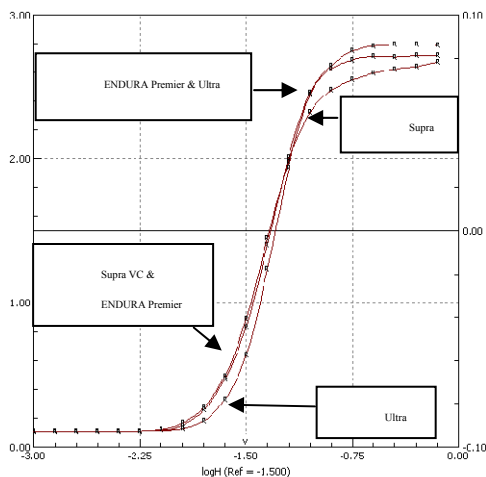


Figure 2. KODAK PROFESSIONAL SUPRA ENDURA VC Paper, KODAK PROFESSIONAL ULTRA Paper, and KODAK PROFESSIONAL ENDURA PREMIER Paper

The cyan imaging dye in KODAK PROFESSIONAL ENDURA Premier Paper is also new. The new cyan dye peak has a bathochromic shift compared to the current cyan dye delivering significantly improved color reproduction especially in cyans, greens, blues and cleaner yellows. The cleaner yellow color

reproduction is a result of lower unwanted absorption below 440nm. Figure 3 below is a plot of the dye differences between KODAK PROFESSIONAL SUPRA ENDURA VC Paper and the new KODAK PROFESSIONAL ENDURA Premier Paper.

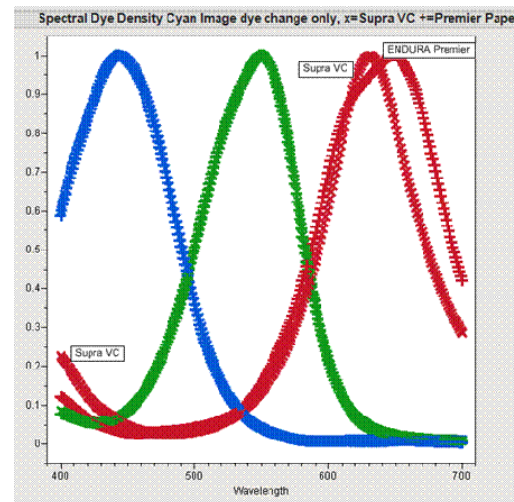


Figure 3. Spectral Dye Density Curves of KODAK PROFESSIONAL SUPRA ENDURA VC Paper and KODAK PROFESSIONAL ENDURA PREMIER Paper (CMY).

Overall the technology changes made to KODAK PROFESSIONAL ENDURA Premier Paper have improved and increased the total color gamut capabilities. When color gamut is measured through commercial digital printers the increase in total color gamut is approximately 5%. Figure 4 below shows the difference on an a^* , b^* plot at L^* 50 as representative. color gamut capabilities of the paper.

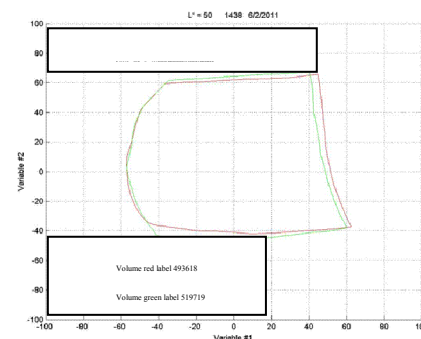


Figure 4. Total Color Gamut comparison of current professional paper and KODAK PROFESSIONAL ENDURA PREMIER Paper

Paper sensitometry was also improved for KODAK PROFESSIONAL ENDURA Premier Paper. As highlighted above the emulsion changes were designed to perform in both the portrait social and commercial markets. The emulsion improvements allow the paper to achieve high print densities with reduced materials and a beneficial environmental impact. With lower silver in the paper the chemical process developer rates can be reduced which means less effluent in the environment. The new

cyan emulsion allows customers to calibrate consistently and robustly to their digital printer aims. See Figure 5 below for representative neutral sensitometry results.

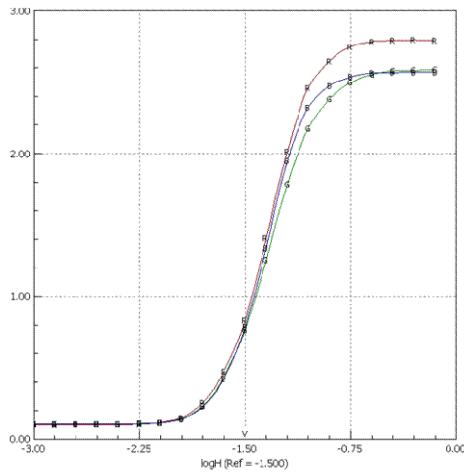


Figure 5. Laser Neutral Sensitometry of KODAK PROFESSIONAL ENDURA PREMIER Paper

Conclusion

KODAK PROFESSIONAL ENDURA Premier Paper was specifically designed for professional labs using digital printers and work flows including color management of the imaging system. Flesh tones, neutral tone scale, color reproduction, and high image permanence are key requirements that professional customers expect in a professional color paper. KODAK PROFESSIONAL ENDURA Premier Paper is able to maintain and improve performance with these important attributes. The paper was built with technology developed by the KODAK development team with input provided by professional labs worldwide during the development paper trials. Together, we have optimized a new professional digital color paper for digital workflows. This paper represents KODAK Professional's continuing commitment to deliver superior products that meet customer needs.

Biography

Patrick Webber is a principal scientist at Eastman Kodak Company. He has worked there for over 35 years and has held a variety of positions in silver halide manufacturing, and research and development. His primary focus for the last 25 years has been the development and commercialization of professional silver halide media products both for optical and digital use. Pat was the systems team leader for the ENDURA Premier Paper design team.