

KODAK PROFESSIONAL SUPRA ENDURA VC Digital Paper – A New Silver Halide Paper Optimized for Color Managed Professional Digital Labs

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Abstract

To meet the needs of professional labs that focus on portrait/social digital imaging, Eastman Kodak Company has developed a new professional digital paper that is optimized for color-managed professional digital labs. This document will review the technologies used in this product as well as the customer benefits provided by this digital paper.

Introduction

For several years the standard professional paper in the portrait social market has been KODAK PROFESSIONAL SUPRA ENDURA Paper. This product has been built to perform both in optical and digital printers. That was especially important during the transition phase of the “Digital Revolution,” when professional labs first embraced digital printers and then had a mix of both optical and digital print engines within their labs. During this transition toward greater digital output, a lab needed one paper product that could fulfill their needs in all of their printer types, and KODAK PROFESSIONAL SUPRA ENDURA Paper met these needs. Today most of the market is capturing with digital cameras and printing with digital printers. Professional labs are color managing their images in printing either with the proprietary printer manufacturer’s software or with external ICC output profiles. With these work flows coming into place in professional labs, it was time to improve and optimize paper for digital output. Therefore, KODAK PROFESSIONAL SUPRA ENDURA VC Digital Paper was developed. The product label is shown in Figure 1.

usage of professional photographic paper in digital printers only. The team did not have to be concerned about compromising the paper’s digital performance for use in optical printers. With this product requirement in place, and without the restriction of optical printing, the development staff developed and built emulsions and imaging dyes that are optimized for color-managed digital images in digital printers for the portrait social market. An accurate flesh tone, including color reproduction, is extremely important to this market. Other key attributes of a professional paper that are also important to customers include printer calibration robustness, chemical process stability, and post-process applications such as print mounting, retouching, and other applications after printing. To address these issues, factorial experiments were conducted evaluating silver, gelatin, sensitometry, and other chemical levels to ensure quality performance that meet 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, digital-only professional silver halide paper for use in the portrait social market. Product features are shown in Table I.

KODAK PROFESSIONAL SUPRA ENDURA VC Digital Paper Features

Table I

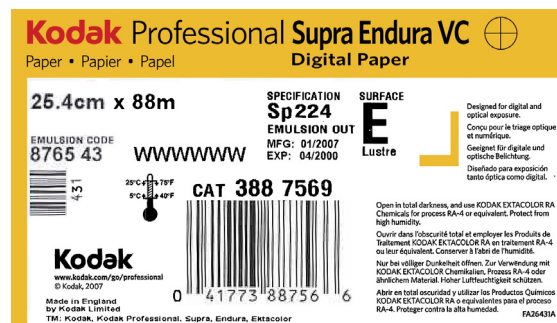


Figure 1. KODAK PROFESSIONAL SUPRA ENDURA VC Digital Paper.

Product Development

Product development of KODAK PROFESSIONAL SUPRA ENDURA VC Digital Paper focused on customer

Features	Benefits
Robust and economical printing and processing	Print consistency; easy to calibrate digital printer Reduced developer replenishment rate
Exceptional high-intensity reciprocity characteristics	Optimized for all digital exposing devices, CRT, LED, and laser printers Optimized text fringing characteristics
Advanced color coupler technology	Strong, bright colors Vibrant greens, blues, magentas, and reds Clean-looking whites Neutral tone scale performance

Technology

Several new technologies were developed for use in KODAK PROFESSIONAL SUPRA ENDURA VC Digital Paper, technologies that were made to improve several areas in the paper's performance. The first improvement was made in the paper's spectral sensitivity performance. A new red absorber dye was developed to make the paper faster and more robust to digital exposure printers. This change also had an impact on red color reproduction. Below in Figure 2 is a comparison of the previous professional paper's spectral sensitivity, displayed by the dashed line, to that of KODAK PROFESSIONAL SUPRA ENDURA VC Digital Paper. The solid lines with arrows represent the printer laser spectral power distribution. Notice the significant increase in sensitivity in the red region with the KODAK PROFESSIONAL SUPRA ENDURA VC Digital Paper. This change in sensitivity in the red increases the calibration robustness of the paper. Also note the lack of red sensitivity in the 500–550 nm range. This change improves red color reproduction, resulting in a lighter, purer red color.

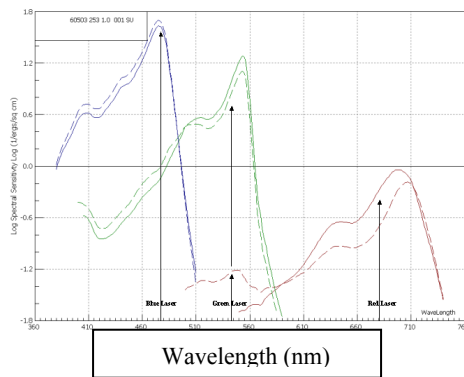


Figure 2. Spectral Sensivities of previous professional paper and KODAK PROFESSIONAL SUPRA ENDURA VC Digital Paper.

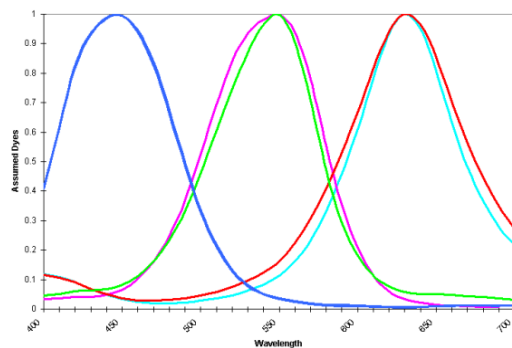


Figure 3. Spectral Dye Density Curves of previous professional paper (RGB) and KODAK PROFESSIONAL SUPRA ENDURA VC Digital Paper (CMY).

The cyan and magenta imaging dyes in KODAK PROFESSIONAL SUPRA ENDURA VC Digital Paper are also new. The cyan dye is narrower in shape than the previous cyan dye, delivering significantly improved color reproduction especially in cyans, greens, and blues. The new magenta dye also improves colors with less unwanted absorption in the red and blue region. Red color reproduction is significantly improved with the imaging dye change along with the spectral sensitivity improvement. In Figure 3 is a plot of the dye differences between KODAK PROFESSIONAL SUPRA ENDURA VC Digital Paper and the previous professional paper.

Overall the technological changes made to KODAK PROFESSIONAL SUPRA ENDURA VC Digital Paper have improved and increased the total color gamut capabilities of the paper. When color gamut is measured through commercial digital printers, the increase in total color gamut is approximately 10%. Figure 4 shows the difference at $L^* = 50$ as representative.

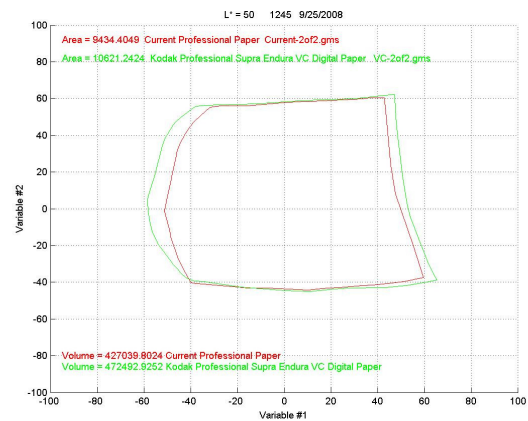


Figure 4. Total Color Gamut comparison of previous professional paper and KODAK PROFESSIONAL SUPRA ENDURA VC Digital Paper.

Paper sensitometry was also improved for KODAK PROFESSIONAL SUPRA ENDURA VC Digital Paper. The emulsion efficiency and gamma were changed to improve printer calibration robustness and reduce chemical process developer usage. The emulsion improvements allow the paper to achieve high print densities with reduced materials. With lower silver in the paper, the chemical process developer rates can be reduced, which means less effluent in the environment. Higher contrast emulsions allow customers to calibrate consistently and robustly to the digital printer aims. See Figure 5 for representative laser neutral sensitometry results.

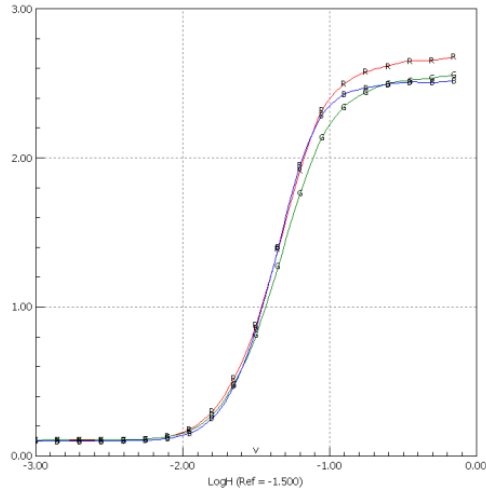


Figure 5. Laser Neutral Sensitometry of KODAK PROFESSIONAL SUPRA ENDURA VC Digital Paper.

Conclusion

KODAK PROFESSIONAL SUPRA ENDURA VC Digital 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, and color reproduction are key requirements that professional customers expect in a professional color paper. KODAK PROFESSIONAL SUPRA ENDURA VC Digital Paper is able to maintain and improve performance with these important attributes. The paper was built with technology developed by Kodak's 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 high-quality products that meet customer needs.

Biography

Patrick Webber is a principal scientist at Eastman Kodak Company. He has worked at the company for over 30 years and has held a variety of positions in silver halide manufacturing and in research and development. His primary focus for the last 20 years has been the development and commercialization of professional silver halide media products both for optical and digital use. Pat is the systems team leader for the SUPRA ENDURA VC Digital Paper design team.