

**Xerox Nuvera® 288 EA Perfecting Production System**

Monochrome digital presses have finally crossed the threshold to be deemed competitive, and in some cases, even surpass the quality requirements posed by high quality monochrome production printing applications. These high-speed monochrome digital presses are targeted towards markets such as transactional and promotional pieces, brochures, catalogs, direct mail, and even high-quality coffee table books.

The *SpencerLab* Digital Color Laboratory, a division of Spencer & Associates Publishing, Ltd., took a comprehensive look at the comparative Print Quality of the Xerox Nuvera® 288 EA Perfecting Production System (Nuvera 288) and Océ VarioPrint 6250 (VarioPrint 6250) digital presses, and Sheet-fed Offset technology. Even though digital presses have the short run, quick print, short turn-around advantage, Offset Print Quality has long been considered the “go to” technology for most high-quality monochrome commercial printing. Hence, Offset technology output was included in the competitive mix to set the benchmark for high quality output that the digital presses are striving to meet. Offset technology sets the quality bar quite high, with the 2400x2400 dpi addressability. Our tests found the Nuvera 288 Print Quality to be closer to Offset quality than the VarioPrint 6250.

The *SpencerLab* Digital Color Laboratory was commissioned by Xerox Corporation to perform this independent comparison of the Print Quality attributes.

**EXECUTIVE SUMMARY**

In this research *SpencerLab* took a comprehensive look at various Print Quality attributes of the Xerox Nuvera® 288 EA Perfecting Production System as compared to its digital counterpart, the Océ VarioPrint 6250, and Sheet-fed Offset technology.


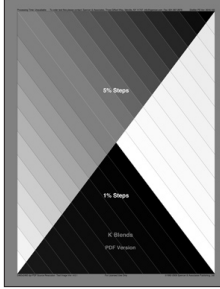


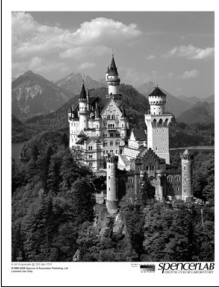

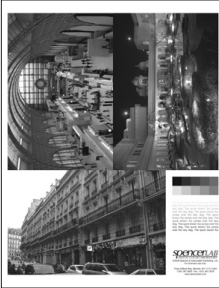
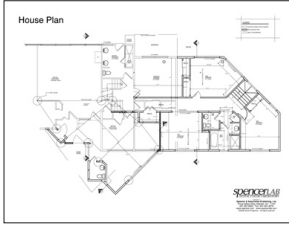
Beyond being suitable for short run, high speed, on-demand jobs, the Print Quality of the Nuvera 288 was found to be very competitive for the target market – overall, surpassing the VarioPrint 6250. The Nuvera 288 Print Quality was closer to that of Offset than the VarioPrint 6250, and even better than Offset output in the area of Black Density.

**KEY FINDINGS**

*SpencerLab* analysis found that ***the overall Print Quality of the Xerox Nuvera® 288 EA Perfecting Production System surpassed its digital competitor and was fully competitive with Offset Quality for target market applications, sometimes even exceeding it.***

On both uncoated and coated media, Nuvera 288 Black Text was rendered crisper and thinner than VarioPrint 6250 output. Both printers maintained legibility down to 2-point size even without magnification.

On both uncoated and coated media, Nuvera 288 Black Lines were rendered sharp. VarioPrint 6250 Lines were produced thicker than Nuvera 288 Lines, and in doing so, lost fine details.

			
<i>Enhanced Black</i>	<i>Gray Tints</i>	<i>Catalog Page</i>	<i>Asian Dragon</i>
			
<i>Castle</i>	<i>People</i>	<i>Buildings</i>	<i>House Plan</i>
<b>Test Files from the <i>SpencerLab</i> Printer Test Suite</b>			

Offset Tints were comparatively the smoothest; but screening was noticeable on all printers' outputs — and more noticeable on uncoated than on coated media.

VarioPrint 6250 Blends exhibited distracting banding in the machine direction, which was visibly worse on coated media, perhaps attributable in part to an excessive screening frequency for the available resolution.

Banding and contouring were noticeable on VarioPrint 6250 Images and made the Images look “dirty”. Again, as with Blends, output defects were visibly worse on coated media.

Black Density and Gloss achieved by the Nuvera 288 was higher than VarioPrint 6250 on both media types. VarioPrint 6250 output exhibited speckling — white voids in solid black areas — on both uncoated and coated media, effectively reducing the visual Black Density.

## PRINT QUALITY ANALYSIS

### METHODOLOGY

Our methodology involved the following key elements: a) selection of appropriate test files, b) determination of comparable print media and settings, c) identification of representative printing facilities, d) supervision of the actual printing, and e) analysis of comparative print quality attributes.

Test files need to rigorously test print quality parameters such as TEXT & LINES, TINTS & BLENDS, and IMAGE reproduction. Taking this into consideration, test files containing a mix of text, graphics, and photographs in their PDF versions, were selected from *SpencerLab* internal files and from the recently publicly-released *SpencerLab* Printer Test Suite (ver. 4) [see illustration above].

In order to obtain comparable output, manufacturer-agnostic media was utilized on all competitive devices; uncoated International Paper Accent Opaque (60# text) and coated NewPage Sterling Ultra (80# text). Digital versions of both media were supplied by

Competitive Test Matrix		
Media	Printer	Setting
Uncoated media comparison (IP Accent Opaque Digital/Accent Opaque 60# Text, 96 brightness, smooth)	XEROX Nuvera 288	125-lpi (default)
	Océ VarioPrint 6250	
	Sheetfed Offset	133-lpi
Coated media comparison (NewPage Sterling Ultra Digital/Sterling Ultra 80# Text, 90 brightness, gloss)	XEROX Nuvera 288	156-lpi (highest)
	Océ VarioPrint 6250	180-lpi (highest)
	Sheetfed Offset	175-lpi

SpencerLab for printing on Xerox and Océ devices, and the offset version of the media was procured by the offset vendors. Comparable print quality settings were specified for each printer.

Multiple vendor facilities were identified and used in order to assure representative print quality. Printing was performed at two vendor locations for each print system, and the print set from the vendor providing better overall quality was selected for inclusion in the competitive analysis. Nuvera 288 prints used in the analysis were printed at the Xerox Gil Hatch Center facility in Rochester, NY, VarioPrint 6250 prints at Sterling Greenaways in Deer Park, NY, and Offset prints from a Heidelberg Speedmaster 74 sheet-fed offset press with a Kodak 5080 Trendsetter VLF Quantum platemaker at the Print Applications Laboratory of the Rochester Institute of Technology. Printing at all vendors was supervised on-site by SpencerLab personnel.

Comparative analysis of Print Quality attributes was performed by a team of experienced SpencerLab analysts.

## PRINT QUALITY RESULTS OF ANALYSIS

Print Quality analysis included the areas of TEXT & LINES, TINTS & BLENDS, and IMAGES on both uncoated and coated media.

### TEXT & LINES

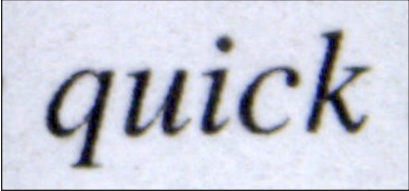
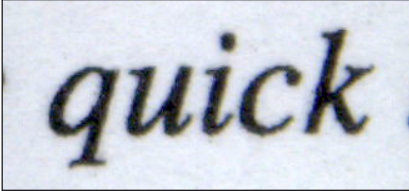
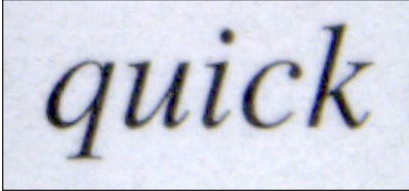
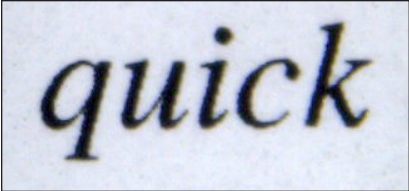
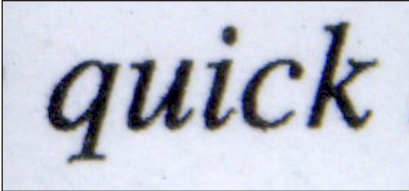
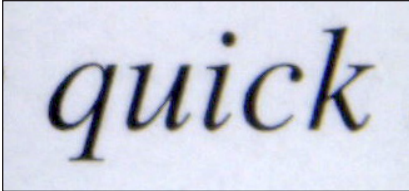
Text and Lines represent the most common elements of a printed document. As the primary vehicle for communicating ideas, most Text fonts are intended to be very legible yet unobtrusive to the reader. Text and Lines should be rendered thin, sharp, and well-defined. Quality limitations can cause distractions that subtract from the effectiveness of the communication; in the worst case, they can render Text illegible or Lines misshapen.

As a graphical element, Lines are critical in representing data, forming the basis of schematic rendering and contributing to artistic graphics.

#### TEXT

On both uncoated and coated media, Nuvera 288 Text was of slightly higher quality than VarioPrint 6250 output. VarioPrint 6250 Text was rendered thicker than Nuvera 288 Text, and hence did not appear as crisp. Both printers maintained legibility down to 2-point size, even without magnification. Nuvera 288 Text exhibited minor dropouts on fine serifs at 6-point and below. Due to thicker character rendition, no apparent dropouts were visible on VarioPrint 6250 Text. Offset Text appeared crisper than both Nuvera 288 and VarioPrint 6250 Text.

Nuvera 288 Reverse Text was rendered sharper than VarioPrint 6250 Text and was legible down to

Text Comparison Examples ( <i>Enhanced Black 6-point Size Text extracts</i> )			
Uncoated Media			
			
	Xerox Nuvera 288	Océ VarioPrint 6250	Offset

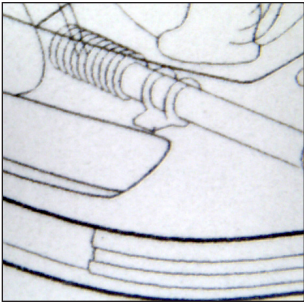
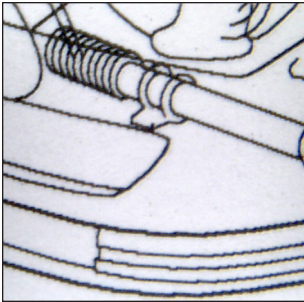
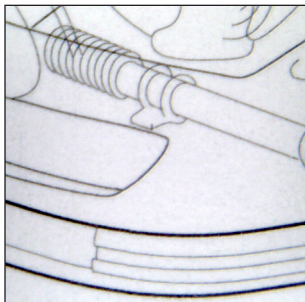
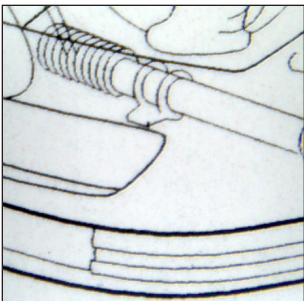
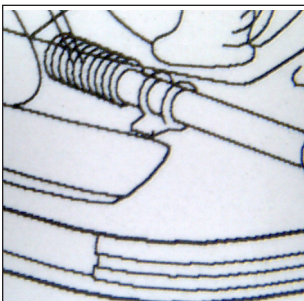
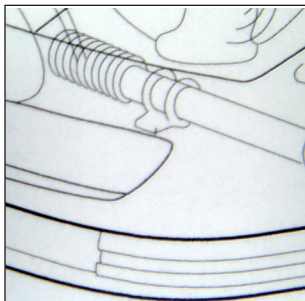
4-point, without magnification. Due to VarioPrint 6250's thicker character rendition, it's Reverse Text was legible down to 2-point size. Fill-ins on Nuvera 288 fine serifs were seen at 8-point Text and below, and on VarioPrint 6250 output at 4-point and below.

On uncoated media, the Nuvera 288 and VarioPrint 6250 produced richer Blacks than Offset, resulting in Text that had better contrast on the page; Offset output appeared desaturated in comparison.

Speckling was noticeable on VarioPrint 6250 output on both coated and uncoated media.

**LINES**

On both uncoated and coated media, Nuvera 288 Lines were rendered sharper and maintained better fine detail rendition than VarioPrint 6250 Lines, although very fine lines on Nuvera 288 output appeared slightly uneven in thickness. VarioPrint 6250 Lines were produced thicker than Nuvera 288 Lines and lost fine details, resulting in 3-D line drawings

Lines Comparison Examples ( <i>Enhanced Black extracts</i> )			
Uncoated Media			
			
	Xerox Nuvera 288	Océ VarioPrint 6250	Offset

that appeared as one-dimensional. Under magnification, VarioPrint 6250 Lines displayed jaggedness.

Curved Lines were rendered smooth on Nuvera 288 and Offset output, with Offset slightly smoother. VarioPrint 6250 Curved Lines displayed jaggedness under magnification.

Nuvera 288 Radial and Reverse Radial Lines were rendered finer than VarioPrint 6250, which appeared jagged under magnification. Offset Radial and Reverse Radial Lines were rendered finer than both Nuvera 288 and VarioPrint 6250.

Overall, Lines produced by Offset were rendered crisper and sharper than both Nuvera 288 and VarioPrint 6250, with Nuvera 288 Line rendition closer to Offset quality than VarioPrint 6250 Lines.

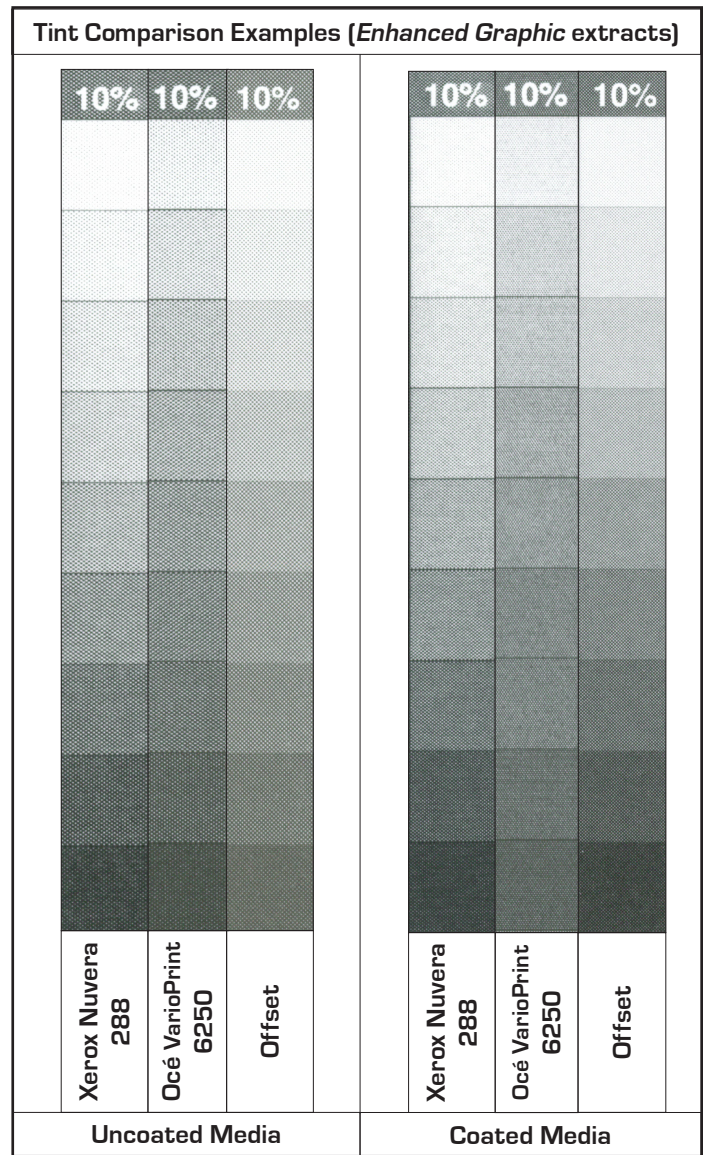
## TINTS & BLENDS

Tints are areas of a single unsaturated color, such as a particular level of gray. Tints possess an increased sensitivity to graininess and artifacts, but should ideally be rendered smooth and uniform.

Blends are transitions between tints, either from highlight to shadow areas or as gradients. Blends should be rendered smoothly, without harsh steps and with a sufficient number of intermediate shades to smooth the transition from highlights to shadows. Tint smoothness and uniformity are primarily dependent on the printing engine, whereas Blend smoothness depends more upon the processing capabilities of the DFE/RIP.

On both uncoated and coated media, Nuvera 288 Tints and Blends appeared smoother than VarioPrint 6250 output. Offset Tints and Blends were comparatively the smoothest, although screening was noticeable on all printers' outputs – and more visible on uncoated than on coated media. Nuvera 288 Tints appeared slightly blotchy, whereas VarioPrint 6250 output exhibited distracting banding in the machine direction, which was exacerbated on coated media.

On coated media, both the Nuvera 288 and the VarioPrint 6250 were tested at their highest screen



frequency options; while both systems produced smoother screening than at their default screen settings, the VarioPrint 6250 screen frequency of 180-lpi did not yield a higher Blend print quality than the Nuvera 288 since the correspondingly more limited range of gray shades reproduced noticeable contours. The Nuvera 288's highest 156-lpi setting provided higher overall Blend quality.

On 10% to 90% Tints [see illustration], the Nuvera 288 provided more linear steps than the VarioPrint 6250. This linearity resulted in better contrast on Nuvera 288 output as a whole. The lack of linearity on VarioPrint 6250 Tints and Blends, especially in the mid-tone range, resulted in output that was flat overall.

Images Comparison Examples (*Enhanced Black extracts*)



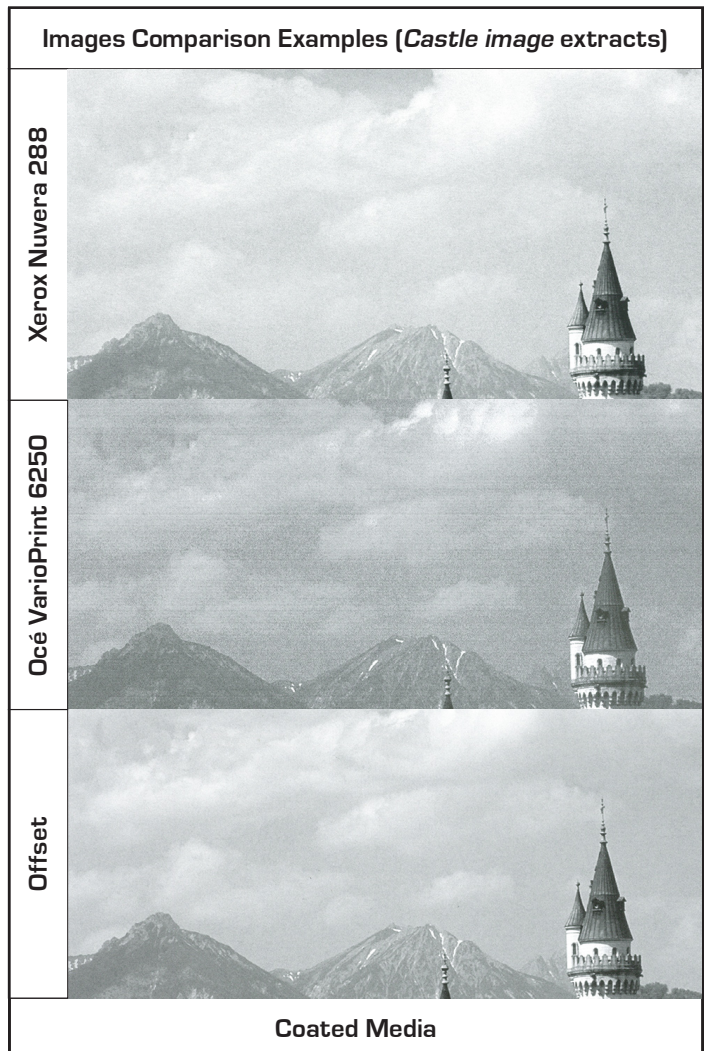
On uncoated media, some mottling was noticeable on solid fill areas of both Nuvera 288 and Offset output. Although mottle-free, the VarioPrint 6250 output exhibited distracting banding.

**IMAGES**

Often it is the image on a page that commands readers' first attention. Images are the visual perception of ideas and products and are used to easily communicate a message to the audience.

Image quality is crucial. Image reproduction must be rendered pleasingly with richness, sharpness, realism, and lack of defects in order to most effectively deliver their value. They need to be rendered with the right balance of contrast, definition, and highlight and shadow detail.

Nuvera 288 Images were rendered smoother than VarioPrint 6250 Images on both uncoated and coated media. Shadow details were better on Nuvera 288 output than on VarioPrint 6250 output, although highlights appeared slightly blown-out. Nuvera 288 Images had better depth, contrast and sharpness, due to it's darker Black, than both VarioPrint 6250 and Offset outputs, on both media. Offset Images were rendered smoothest.



Distracting banding was visible on VarioPrint 6250 Images, and was more prominent on the coated media. Contouring occurred on VarioPrint 6250 Images, creating output with a “dirty” appearance.

As with Blends, the higher screen frequency of the VarioPrint 6250 – although higher than that of the Nuvera 288 – produced lower overall print quality.

## MISCELLANY

All printers’ Text and solid Black areas exhibited some bronzing, with VarioPrint 6250 bronzing the most severe. Speckling is apparent on VarioPrint 6250 output, on both media types, again on Text and in solid Black areas. This speckling effect factors into the VarioPrint’s diminished visual Black density.

## BLACK DENSITY

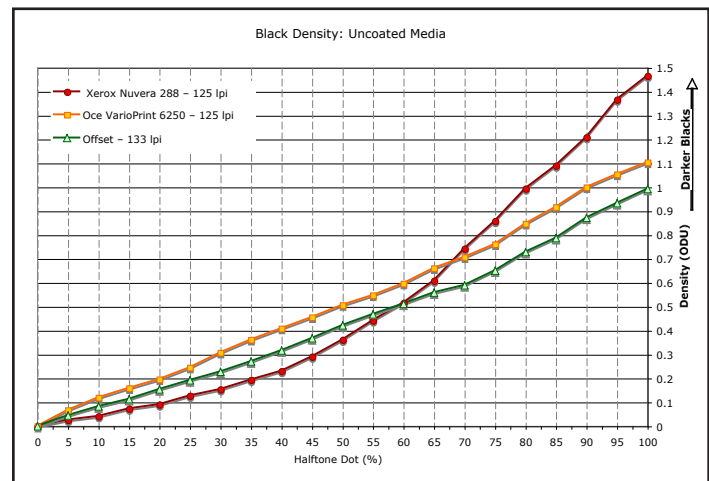
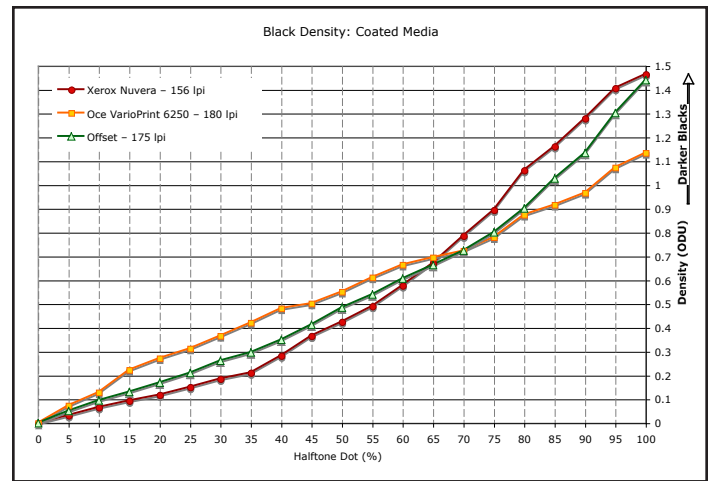
High density Blacks provide users with crisp, sharp text and graphics, and with photographic images consisting of superior detail, especially in high contrast areas.

Black optical density measurements were taken using a calibrated X-Rite 939 series Spectrodensitometer, determining the Status T (DEN T) visual density values of halftone steps in the *Gray Tints* test file.

Black Density achieved by the Nuvera 288 on both media was substantially higher than that of the VarioPrint 6250 and of Offset. When moving from uncoated to coated media, density readings of the Nuvera 288 and VarioPrint 6250 were virtually unchanged, whereas Offset’s Black Density was much higher on coated media than on uncoated.

On uncoated media, excellent Black Density was achieved by the Nuvera 288 (1.47 ODU) and was substantially higher than both the VarioPrint 6250 (1.10 ODU) and Offset (1.00 ODU). VarioPrint 6250 and Offset Black Density curves were flat compared to the Nuvera 288’s curve that increased exponentially.

Black Density on coated media, of the Nuvera 288 was higher than the VarioPrint 6250 (1.47 *vs.* 1.13

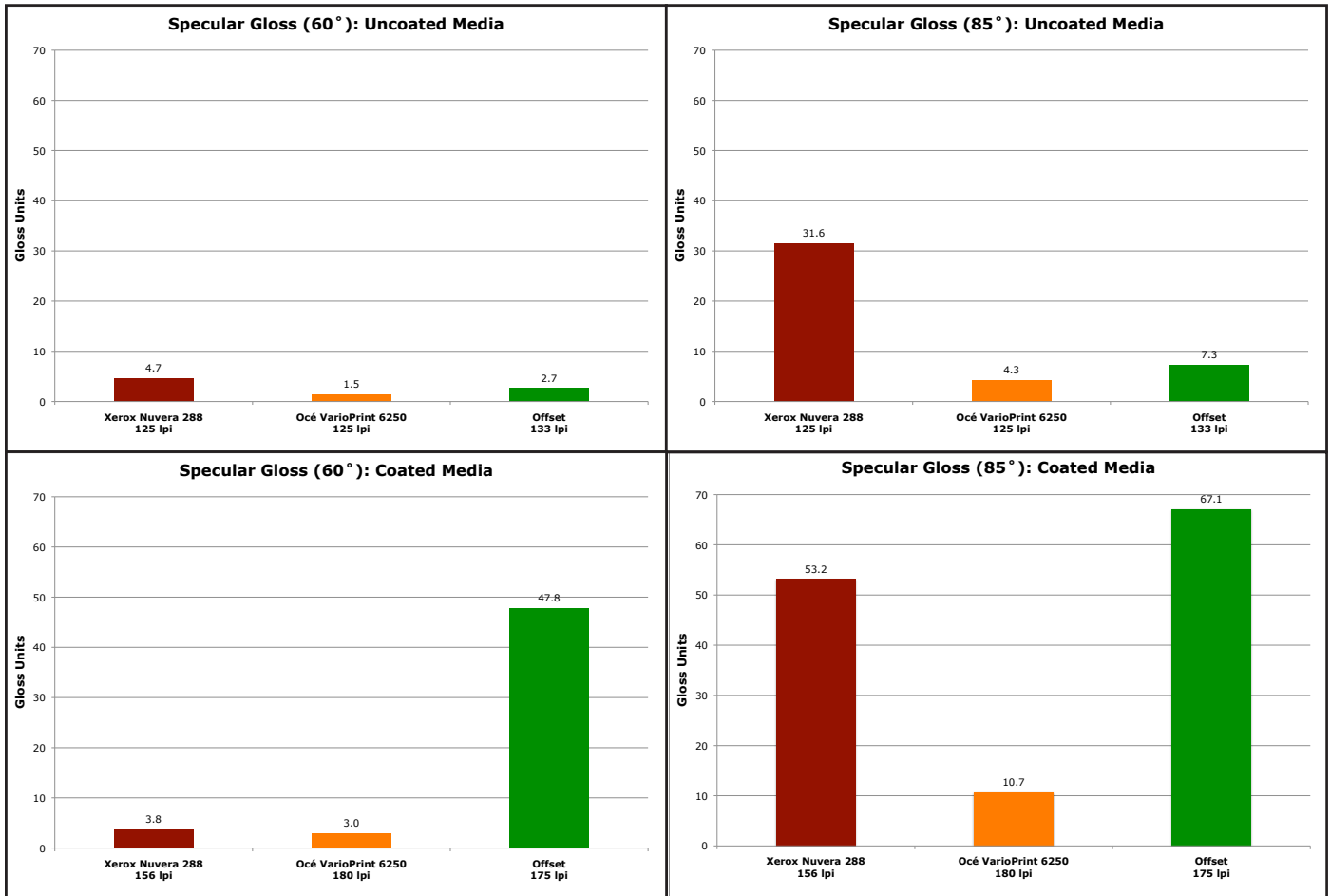


ODU). Offset provided Black with density comparable to the Nuvera 288, at 1.44 ODU. Nuvera 288’s and Offset’s Black Density curves were similar in their exponential increase, whereas the VarioPrint 6250 curve remained flat. Additionally, VarioPrint 6250’s Density curve was irregular due to the banding on output.

## SPECULAR GLOSS

A glossy print immediately draws readers’ attention and can provide a feeling of richness to the document. Specular gloss is one of several related appearance attributes that produce the sensation of gloss.

Gloss measurements were performed using a calibrated BYK Gardner micro-TRI-gloss gloss meter. In accordance with industry practice and per the gloss meter manual, an 85° geometry measurement should be used if the measurement at 60° geometry is less than 10 GU. An average of three readings along



the 100% solid Black band on the *Gray Tints* test file was used for analysis.

Specular Gloss of the Nuvera 288 output, on both uncoated and coated media, was of higher value than VarioPrint 6250 output, at both 85° and 60° geometries.

On uncoated media, Nuvera 288 Gloss was highest, at 31.6 GU at 85° geometry, compared to substantially lower Gloss of VarioPrint 6250 and Offset outputs, measured at only 4.3 GU and 7.3 GU respectively.

On coated media, Nuvera 288 Gloss was 53.2 GU at 85° geometry, with VarioPrint 6250 having the lowest Gloss at 10.7 GU. Offset Gloss was highest on this media at 67.1 GU.

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## THE *spencerLAB* DIGITAL COLOR LABORATORY

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*SpencerLab* is operated by Spencer & Associates Publishing, Ltd., a premier IT consulting boutique specializing in Digital Color Imaging. Since 1989 Spencer & Associates has provided strategic support in product planning, development, and launch to manufacturers, and workflow analysis, usage optimization and print system selection to corporate users.