

## Taking the Cure

By Jim Rosenberg

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UV-curable inks aren't new — they're just new to newspapers, for which they may prove a product-enhancing alternative to costly heatset printing. What's more, they don't release troublesome volatile organic compounds that heatset operations must control.

In commercial use for at least 30 years, the inks don't dry by absorption of carrier oil by newsprint, as in lithography, or by evaporation of water or other solvent, as in flexography. Instead, the liquid ink solidifies upon exposure to intense ultraviolet energy.

Because UV-curable inks sit on the surface of paper rather than spreading into its fiber, reproduction tends to be bold and crisp. For the same reason, absorbent newsprint is not needed. So a newspaper press running UV inks can put glossier, scuff-resistant printing on higher-quality paper.

That required UV ink technology "slightly modified for coldset," says US Ink Marketing Services Manager Todd Wheeler.

At Flint Ink North America, New Business Technical Support Director Alan Applebaum says UV ink "sets up on the substrate, whether it's newsprint, supercal, or coated," allowing a printer to run paper grades on a coldset press "that you've never run before, that you can't run" with ordinary news inks.

UV inks suitable for use on newspapers' web offset presses open up possibilities for commercial jobs such as ad circulars or booklet covers that might otherwise go to a heatset printer, as well as for more-attractive newspaper work — TV programming booklets, special sections, even front pages.

Ina Schlechte, marketing vice president at UV curing technology supplier Prime UV Systems, in Carol Stream, Ill., says newspapers not only can produce better-looking covers for their own products, but with UV inks they also "can get into new markets" with coated stock. "They can get in there and compete at the low end of heatset."

Schlechte says printers using newspaper-type presses have been interested for several years, awaiting an ink suitable for their presses. Prime UV President

Elinor Midlik says by June, the company will have equipped two dozen such installations. Most are singlewide models, but Prime UV can equip presses up to 120 inches wide and inking up to 110,000 impressions per hour.

Prime UV users range from a Mexican newspaper group that prints commercial work to commercial printers with newspaper contracts (including Blue Island Newspaper Printing in Harvey, Ill., and Denmark's Fjerritslev Tryk, which in 1963 printed northern Europe's first offset daily).

### **Invisible light, visible results**

Things changed last fall, Schlechte says, when Flint Ink announced availability of its Arrolith UV inks. Building on experience with UV inks for sheetfed presses, says Applebaum, the "process took almost two years." After development, testing, and "fine tuning" on a Dauphin Graphic Machines 440 tower equipped by Prime UV at the press maker's Millersburg, Pa., plant, the ink entered production trials at four sites.

Since then, some commercial printers have begun using Flint's UV ink on coldset web presses, and several North American newspapers have expressed interest, says Flint Ink National News Ink Manager Norm Harbin. Similarly, US Ink's Wheeler says newspapers only recently have inquired about UV inks, although some are "genuinely interested." At Prime UV, Schlechte says, "We're seeing a lot of interest in Latin America also."

Speaking of coldset printing in general — from newspapers that also print ad inserts and other jobs to strictly commercial printers that may also have heatset capability — Wheeler says "UV will continue to grow in areas where it will be profitable to adopt."

While parent Sun Chemical Corp. has offered UV inks for years, says Wheeler, US Ink wants newspapers to consider all possibilities, from standard to high-strength colors to a UV formula. Not playing down UV's potential so much as trying to move from "buzz to reality," he says, "We just want people to know what they're getting into."

Favorably comparing UV coldset to heatset, Scott Stewart, president of Nebraska Printing Center, says no customer that's tried UV coldset has gone back to conventional offset. The sheetfed and coldset web offset commercial printer in Lincoln modified an existing press for UV inks and installed a new press equipped for UV.

For newspapers, it could mean offering readers and any print customers more than newsprint-based products printed with conventional news ink, for less than the cost of heatset printing. For booklets or magazines with groundwood-grade pages but heavier, glossier covers, UV brings all production in-house, rather than having to stitch in post-press a heatset-printed cover produced and delivered by another printer.

Even lowly newsprint benefits from UV ink, according to Stewart, in whose opinion the brighter ink improves the look of what's printed on lower-grade papers. On a press regularly used to print products on superior paper grades, his shop also runs grocery inserts on newsprint, avoiding the time and work of switching inks while giving the grocer a higher-value product, says Stewart. "It also robs a little moisture from [newsprint]," he adds, giving it a crisper feel and what seems to be "a very light sheen."

Special sections/editions or historical front pages also may be candidates for UV inking on higher-grade paper that, unlike newsprint, won't yellow with age or exposure to light. And those possibilities represent opportunities to upsell advertisers, says Stewart, once a Stauffer Communications advertising director and assistant publisher until he bought a weekly group that he converted to a commercial printing operation in 1986. After all, when even a one-around singlewide prints a broadsheet, it prints three other pages along with the front page.

At least one newspaper has been running UV inks for two years. Having tried both Flint Ink and US Ink formulas, "it's been a pretty good success for us," says Pressroom Manager Wade Morrison, who believes The Tuscaloosa (Ala.) News is the first U.S. paper to run UV ink on a web press.

Equipped with stitch and trim capability, the 34,781-circulation daily uses UV ink to print, among other things, quarterfold coupon books or special products for itself or the New York Times Co.'s other Alabama dailies; the cover of Outdoor Alabama magazine; and ad inserts for auto dealerships.

Morrison calls UV ink an alternative to the "very different and more complex" heatset process. Tuscaloosa's experience dates from early 2003, when Bob Urillo, senior manager of strategic sourcing and contracts at the Times Co.'s Shared Services Center, mentioned that he thought printing with UV ink on a newspaper press was viable and worth pursuing. That spring, Morrison says, the News hosted a UV printing seminar in its new building. Managers also visited DGM's test press in Pennsylvania.

After testing UV inks on its own press to determine if it called for neutral or mild acid fountain solution and if standard newspaper plates could be used, the News installed an ultraviolet curing unit ("basically, two 600-watt sunlamps," says Morrison) on one of its eight-couple, full-color Goss/Heidelberg Mercury towers and took UV ink into limited production.

Morrison says the unit is not a dedicated UV-ink tower, but instead is dedicated two or three Mondays each month to UV ink. "We go back and forth quite a bit," he says.

## **Low tack, no track**

Besides pigment, UV-curable inks contain resins and photoreactive initiators. The resins consist of monomers and oligomers — molecules of one and a few structural units, respectively. Free radicals generated by the initiators' exposure to UV energy cause the acrylate resin's less-complex molecules to form a solid, cross-linked polymer. Heat from the UV units aids in the process, according to US Ink. (That may explain the moisture depletion noticed by Stewart.)

To behave properly on press, Applebaum explains, "we needed to build an ink that had a tack equal to the conventional product's" — one suited to coldset roller trains so that the sheet would not stick to the blanket. Tack — the pulling force that can cause picking of the sheet — was reduced to less than half that of sheetfed formulas, he says. The viscosity of the product is the same as conventional news ink, he adds, but Flint makes Arrowlith UV only for open-fountain presses, not those with injector inkers.

Water interaction, too, is very much the same as with conventional news inks, "but the window is narrower," says Applebaum. An operator cannot get carried away with the water level, as may happen with newsprint. Coated stock won't absorb water, which can bubble out under the UV lamps, leaving pin-hole print blemishes, he says.

But running UV on coated stock not only means low water, but also a need for less ink. Less ink and immediate curing on the sheet surface yield good dot reproduction and no ink tracking, Applebaum says.

The resin cures in under a tenth of a second when exposed to intense UV light at a wavelength of 360 nanometers, says Prime UV's Midlik, so presses shouldn't ordinarily need to be slowed when running UV inks. "We would properly outfit the press with UV to run at the maximum speed of the press," she notes, adding that Prime retrofits three installed presses for every new one it equips.

Pressrooms tight on space probably can accommodate UV curing, according to Prime UV. Midlik says that curing units, usually staggered, can face each other where necessary, and that "You can outfit a press in 12 inches of space ... in the web direction." For service and cleaning, says Schlechte, some room is required to slide the cassette containing the UV lamp in and out of the curing unit's housing, which also holds a reflector and shutter. Maintenance, in fact, is part of Prime UV's Smart 2100 software controls system.

Schlechte says a singlewide press printing with UV inks can typically run up to 35,000 or 40,000 impressions per hour when equipped with two 400-watt, 10-inch-high UV lamps on each side of the web. Depending on the press, a 600-watt lamp on each side may suffice, according to Midlik.

Morrison says UV inking has progressed from "basically a dry-trap system" — in which each color ink is cured before the next color ink is applied — to a wet-trap

system. "We don't dry or cure the ink until after we've printed all four colors," he says. The lamps cure it all "before it hits the first lead roller."

UV inks will not work with the rubber found on newspaper press roller coverings and blankets. Applebaum says a vinyl nitrite compound is used on rollers and another, known generically as EPDM, can be used for both blankets and roller covers.

Flint recommends a mild-acid fountain solution, which Applebaum says "cleans up much better" and can be used as well on units running conventional news inks.

### **Making the switch**

"If you're not doing well in terms of your daily's color reproduction, and you leapfrog into UV," Wheeler warns, "you're going to have less-than-desirable results."

"This thing had to be handled precisely," says a similarly cautionary Applebaum. Recalling the first field tests, he says printers had little free press time — which required that they switch back and forth between UV and conventional inks. What's more, "it's a long learning curve," says Stewart from Lincoln, adding that Flint Ink correctly advised him that it would take three months or more.

"Everything's very, very, very sensitive," says Stewart, referring to selection of and settings for consumables, which can differ from press to press in the same shop. He also emphasizes vendor support when adopting UV inking. "Without that, you're dead in the water," he says, adding that he was "extremely pleased" with assistance from Flint and Fuji, which supplied a platesetting system and consumables other than paper and ink. Fuji expected its plates to come close to their expected 250,000-copy run lengths when used with UV inks. When they topped out at 40,000-50,000 copies, says Stewart, Fuji provided, at no charge, a post-bake system for the plates that restored their durability.

Citing press capacity, total work, volume of UV work (number and size of print jobs), and issues of ink plumbing and cleaning, Wheeler says printers contemplating work with UV ink must decide how they may best fit that work onto presses and into schedules.

For UV work, he continues, some may routinely dedicate one day to one color tower, as in Tuscaloosa, or permanently dedicate one tower or press, as The Dallas Morning News subsidiary DFW Printing Co. does with a narrow-web Didde press.

Because it does not dry, UV ink can stay in a dedicated unit or press without waste or maintenance problems. Being able to dedicate a time slot or press position is helpful because the changeover must be done right. Though he strongly recommends dedicating a tower, Applebaum says that once a crew

becomes accustomed to the changeover, the procedures are not time-consuming. Morrison puts Tuscaloosa's UV-equipped tower's turn-around time at 3 to 4 hours. Stewart says changing to UV ink takes longer than switching back because "the printing portion of the press has to be positively immaculate."

Because oil is "the one thing that inhibits cure," Applebaum explains, care must be taken with wash-up for a part of a press that periodically runs UV ink. An unpigmented UV ink is then run for about 10 minutes to condition surfaces before being removed with a roller wash formulated for UV inking.

While Flint Arrowlith UV relies on enough soy-derived content to carry the Soy Seal of Approval, it is not the soybean oil used in place of the petroleum-based vehicle in some widely used news inks. Applebaum says the proprietary soy-based component "isn't in the oil form. It's in the varnish part of the ink."

### **Care and cost**

UV-curable inks have no VOCs, solvents, or polymerization byproducts. Properly operating curing units can produce traces of ozone but only very briefly, as energy output passes through the 185nm range while powering up, according to On-Line Energy Inc. The Pleasanton, Calif., company supplied UV systems for DFW Printing and Nebraska Printing Center, among others.

"There is no ozone present in [our] venting process," says On-Line Energy Marketing Vice President Craig Blair. Contrary to some published precautions, the only reason for venting is to move heat away from the UV bulb, he says. Except for one study in which start-up added only a few parts per billion to background ozone levels, any ozone in air exhausted under pressure has not been measurable, Blair says.

Personal precautions for UV inks and news inks are similar. While soap-and-water wash-up is usually adequate, contact should be avoided and gloves or barrier creams are recommended, regardless of the chemistry being used, according to US Ink. Installation and operation also should ensure that operators are shielded from the intense UV output.

UV inks' environmental benefits extend as much to the product as to production. When recovered for recycling, paper printed with the polymer may be de-inked using the existing flotation process, according to US Ink.

Prospective users also will be happy with Stewart's comment on cost: "The capital investment was a fraction of what it would be ... to go heatset." But in determining if they will have the business to justify the investment, newspapers must consider maintenance costs and the inks' higher price.

On a press in full-time production running up to 45,000 impressions per hour and using only UV-curable inks, maintenance of a four-lamp UV system would likely cost between \$1,000 and \$2,000 per year, according to Prime UV's Midlik.

Contributing to that total cost are UV bulbs. Each runs about \$200, she says, and will need to be replaced once or twice a year, depending on use.

As for the ink, though "it could end up being three times the cost of conventional ink," says Flint's Harbin, the mileage may be up to twice that of conventional inks. Also, owing to the nature of the products printed, the ratio of color ink to black ink will likely be higher in printing with UV-cured ink than with news ink. But unlike the latter, UV inks have little difference in cost between black and color. Harbin explains that while pigments are the most expensive ingredient in news inks, pushing up the cost of color, monomers, oligomers, and photoinitiators are the most costly components of UV inks, contributing equally to black and color products.

R.A. Kerley Ink Engineers, in Broadview, Ill., is "doing some UV ink," but it is not a major product, says Senior Account Executive Charles de la Rock. Inserts can be satisfactorily printed with conventional offset inks, he says, adding, "I don't know that it would be applicable to the [price-driven] newspaper industry." He allows, however, that higher oil and pigment prices may shrink the cost difference between news and UV inks.

De la Rock predicts UV ink pricing will stay high because one ingredient is in very short supply, and chemical companies, he says, have been holding back on it.

Since the shut-down of one production plant, "acrylic acid is in short supply," Harbin says. The closure affected the costs of many products that use the acid or chemicals made from it. While smaller suppliers may face raw materials shortages, Harbin adds, Flint has agreements that ensure their availability.

Impression Inks Vice President Ronald Henderson puts the price of conventional ink at \$1 to \$2 per pound and the price of UV-curable ink at \$6 to \$7 per pound. Though it does not now supply UV inks, Impression Inks has recently been considering such a product because some manufacturers of smaller presses are including UV curing units, he says. The company will respond to market demand, say Henderson and Jesse Samaniego, one of his three partners at the Fort Worth ink supplier.

### **Interest at litho, flexo sites**

UV-curable inks for coldset web presses are formulated for offset lithography. But not all UV-curable inks are for offset lithography, and not every newspaper runs an offset press.

About three dozen U.S. dailies are printed by flexography, which applies water-based inks directly from a doctored anilox roller to a polymer relief plate. But while UV inks are available for other flexo markets, neither big ink maker sells a news flexo ink. US Ink's Wheeler says he is unaware of such a product, though he acknowledges UV use in flexo package printing. Flint makes no flexo UV ink, which would require an entirely new formulation to be compatible with a

newspaper flexo press' short ink train, says Applebaum.

"Flint does have an ink that can be used on newspaper flexo presses," insists Midlik. So far, says Schlechte, Prime UV has "a lot of flexo ink installs, but not on newspapers." That may change. "We're in the process ... of quoting a MAN Roland flexo press," says Prime UV Sales Vice President Erich Midlik, confirming that the site is a U.S. newspaper. UV curing on such a press, he adds, can be done as easily as on a coldset web offset press.

In addition to the few strictly commercial coldset web offset printers that have begun using UV-curable inks, at least four newspaper production sites have expressed an interest in the product's potential. With dailies ranging from midsized to major metro, the four represent different newspaper groups.

In Lincoln, Stewart says, "we have gotten a number of phone calls," including one from a newspaper publisher in "far-eastern Iowa" — suggesting yet another large newspaper group's possible interest.

Pondering prospects of adding UV-curing capability at The Indianapolis Star, Operations Director Bill Bolger sees the investment question as one of product versus capacity: "If we build it, will they come? You can't really quote if you don't have the capability."

The 254,437-circulation Gannett daily has a new production plant housing an MAN Roland Geoman doublewide offset press. Though it can pursue monthly publications, those contracts are won mostly on price, he says. The upsell charge, he says, can't make the UV option too expensive for customers.

Though the Star has "a little bit of capacity" available, Bolger says, it has picked up an advertiser's 1.5-million-copy, four- to eight-page weekly product that may allow it to back off on any push for UV. But the pressroom still has "holes" in its schedule and a gluer at the folder to handle commercial jobs.

For now, other items on the Star's agenda include "trying to finish a CTP installation" and continued testing of low-set-off inks, which Bolger says could be adopted instead of UV-curable ink. For the latter to be a feasible alternative offering, he says, "we need to know we can do it economically on shorter runs" or find customers with longer runs.

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