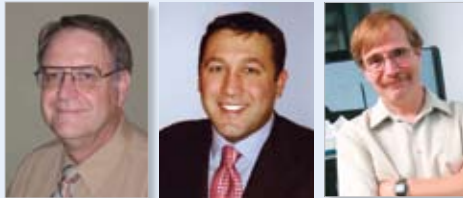


Quest for the Perfect Flatbed

Part III in our three-part Perfect Printer series examines wide-format flatbed printers.

By Alan Anderson, Michael Flippin and Ken Mergentime



Alan Anderson works with Web Consulting, where he manages online market research programs and oversees custom projects. Contact Allan at alan.anderson@web-na.com.

Michael Flippin is president of Web Consulting Inc., a Boston-based consultancy to

the digital printing industry and provider of primary market research and industry reports. Visit Web Consulting at www.web-na.com or contact Michael at michael.flippin@web-na.com.

Ken Mergentime is executive editor of Digital Graphics and Sign Business magazines.

Editor's note: The purpose of this series is to generate open dialogue among industry practitioners regarding the strengths and weaknesses of current inkjet printing technology, with the long-term goal of improving equipment to better meet the needs of the wide-format digital printing community. The first report in the series (Digital Graphics, April) presented end-user comments about outdoor-capable roll-fed printers. The second in the series (Digital Graphics, August) examined digital fabric printing systems.

In this, the final installment of our epic three-part Quest for the Perfect Printer series, we asked industry practitioners to tell us what they think about digital flatbed systems that use ultra-violet (UV) curable ink systems. You may be wondering why we did not review all flatbed digital imaging systems regardless of the ink being used, and that's a good question. The answer is simple: flatbed systems using UV ink are the most common, and these systems are the focus

of considerable industry attention. Only 15 percent of our survey respondents that own digital flatbed imaging systems do not use UV-curable inks.

According to the 2007 Guide to Digital Imaging, published by the Specialty Graphic Imaging Association (SGIA), UV-curable inkjet systems are ranked third (31.6%) as the most commonly used digital imaging devices in the large-format arena. The recent increase in use of UV-curable ink in digital imaging is largely due to the development of flatbed imaging systems.

Digital Ink Systems Used

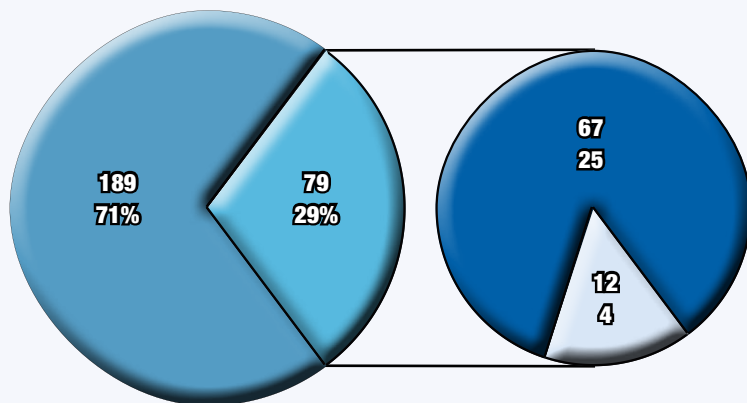
| | |
|------------------------------|--------|
| Solvent based inkjet | 50.40% |
| Aqueous inkjet | 47.00% |
| UV curable inkjet | 31.60% |
| Digital photographic imaging | 20.50% |
| Eco-Solvent inkjet | 17.90% |
| Dye sublimation | 11.10% |
| Thermal transfer | 10.30% |
| Electrostatic imaging | 10.30% |
| Other | 5.10% |

Information courtesy of SGIA

FLATBED IMAGING SYSTEMS

Unlike roll-to-roll digital imaging equipment that can only print onto flexible substrates, flatbed printers can print directly onto rigid substrates. To accomplish this, most systems use some type of table with rollers that carry the substrate under the inkjet printhead. The printhead moves from side to side to image the substrate as it passes underneath. There are also systems incorporating a stationary vacuum table that hold the substrate still while the printhead moves over it via a gantry

Digital Flatbed Printer Ownership



■ Do not own flatbed ■ Own non-UV flatbed ■ Own flatbed using UV ink

Figure 1

Of the 268 readers surveyed, nearly 30 percent currently own a flatbed printer. About 52 percent of the companies that do not own flatbed systems say they have plans to purchase a system within the next year, but most have not decided which system to purchase.

Top Flatbed UV-ink Imaging Systems

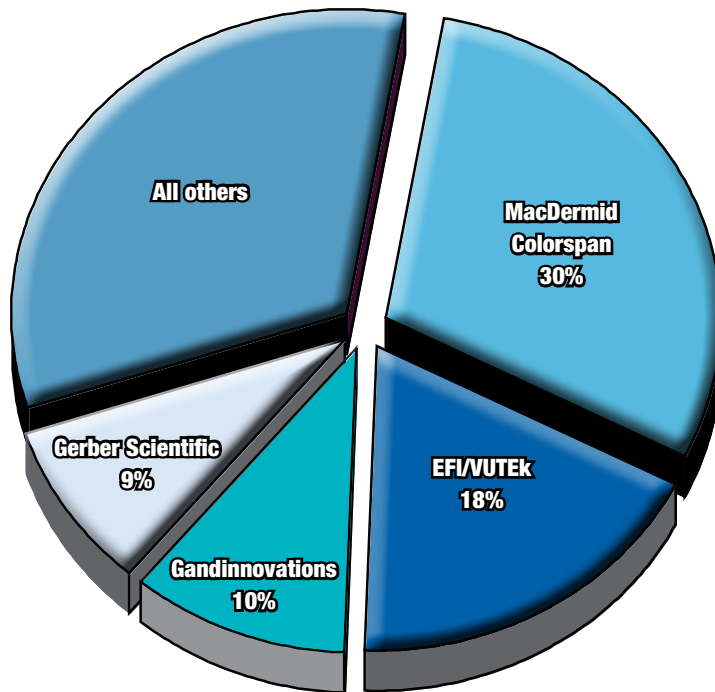


Figure 2
MacDermid ColorSpan has the largest installed base in our sample of flatbed printer owners, with EFI/VUTEK, Gandinnovations and Gerber Scientific garnering the next-biggest share.

system. Systems that can print to both rigid and rolled materials are often called “hybrid” printers. These still fall within the flatbed family.

By being able to image directly onto rigid substrates in a wide variety of thicknesses, flatbed systems reduce or eliminate the need for mounting and laminating products before use. This saves considerable time, material and money in the production of digital graphics, and gives digital imaging a significant advantage when competing for certain types of work against other methods of printing.

SURVEY DETAILS

Our survey was quite long, with a total of 54 questions, but participants were not required to answer every question. The survey was open for participation

online for a two week period between July 20 and Aug. 3, 2007. A total of 268 responses were received from a mailing of approximately 9,050. We believe our participation rate to be quite good, considering the survey was taken in late summer when many people take vacations.

The vast majority of responses were received from companies in the United States (88.8%) but Canada, United Kingdom, Mexico, Malaysia, Puerto Rico, Hungary, New Zealand and Uruguay were also represented in the remaining 11.2 percent of the responses. As expected, Canada had the largest response rate within the international group.

The state of California represents the largest group of respondents in the U.S., with Illinois, Ohio and Texas following close behind. States not represented by

our survey respondents include Alaska, Alabama, Maine, North Dakota, New Hampshire, South Dakota and Wyoming.

TIRE KICKERS

Our target audience for this survey is, of course, companies that own flatbed digital imaging systems using UV-curable inks. From our total of 268 respondents, 79 companies (29%) own flatbed digital imaging systems. However, 12 of those companies (4%) have equipment that does not use UV-curable ink, thus leaving 67 companies (25%) fit our target market (see **Figure 1**).

Companies that currently do not own digital flatbed systems were asked if they have plans to purchase a system within the next year. We were pleased to see that 105 companies (52%) are currently considering the purchase of a flatbed UV-curing digital printer. The majority of those respondents (31%) are undecided as to which system to purchase. For those companies having a specific system in mind, MacDermid ColorSpan is the leading manufacturer named, receiving 21% of the votes. Mimaki (9%) and VUTEk (8%) are also at the top of the list.

HAVING NO INTEREST

The respondents that do not fit our target audience and who are not interested in purchasing a digital flatbed system were asked why they are uninterested in this technology. We received some excellent and revealing answers that are also echoed through the rest of the survey by companies that do own flatbed equipment. We were able to sub-divide nearly 200 reasons into 11 categories, listed here in preferential order:

- 1) Cost of equipment
- 2) Lack of customer demand
- 3) Focus is on other markets
- 4) Not enough space for equipment
- 5) Simply no interest
- 6) Start-up business, not ready for flatbed

Number of Flatbed Digital UV-ink Printers Owned

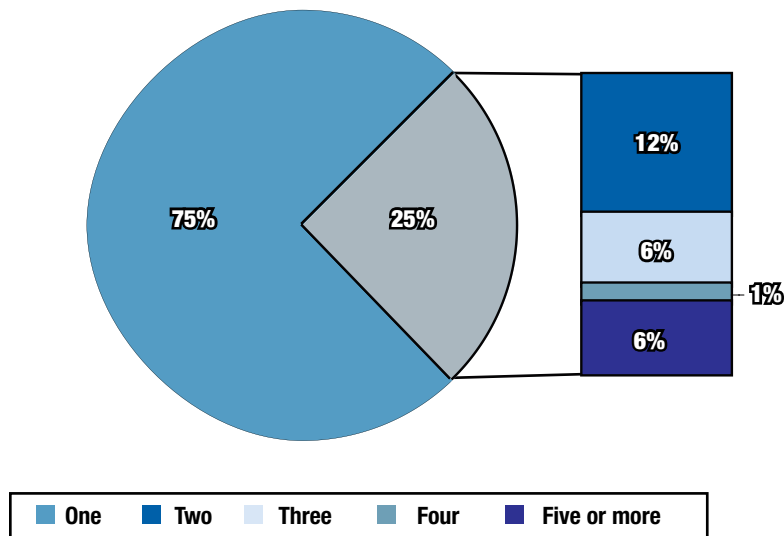


Figure 3
Most flatbed owners surveyed have only one flatbed in their shop and about 25 percent had two or more units.

- 7) Waiting for technical improvements
- 8) Do not like UV-cure ink
- 9) Sub-contract all digital work
- 10) Need other equipment first
- 11) Too busy with other work

The issue of “cost” is continually mentioned in responses throughout our survey. Virtually all respondents want to see the cost of equipment come down. Respondents believe that if more machines were priced in the range of \$70,000 to around \$120,000, more companies would be interested in buying into flatbed technology.

Cost is also an issue of concern to most manufacturers. They certainly realize the need to keep prices in line with the industry’s value point. However, this technology is still relatively new and the industry is still changing rapidly. This stance may be due partly to market perceptions rather than pricing realities. It is interesting to note that in the most recent Printer Update report in *Digital Graphics* (July issue) there are at least 14 models of UV-curing flatbeds listed below \$120,000.

WHAT’S IN YOUR SHOP?

Virtually all digital flatbed machine manufacturers are represented in our target group, with MacDermid ColorSpan having the largest installed base in our sample. The next most popular systems are EFI/VUTEk, Gandinnovations and Gerber Scientific. Other companies mentioned are Durst, Inca Digital, Raster Printers, DuPont, Fujifilm Sericol, NUR Macroprinters, Mimaki, Zünd and HP (see **Figure 2**).

WHO’S WHO?

Our group demographic can be summed up as being a digital printer or service bureau owning at least one flatbed digital UV-ink imaging system that runs at least an average of just less than eight hours each day and is responsible for approximately 37 percent of all company sales (see **Figure 3** and **Figure 4**).

Companies in the digital printer and service bureau category are primarily the ones that own more than one digital flatbed system. All other respondents with the exception of one graphic screen printing company own just one digital flatbed system. The screen printing

company owns four and keeps them very busy running between nine and 16 hours each day.

LIKE IT OR NOT

On average, 70 percent of our target group is satisfied or very satisfied with their digital flatbed system using UV-curable ink. While this is not a bad level of satisfaction, there is significant room for improvement when 18 percent of the group is neutral and the remaining 12 percent are dissatisfied or very dissatisfied with their flatbed system. These figures are based on the level of satisfaction with eleven important system attributes, which will be discussed in more detail later in this article.

Each respondent was asked to tell us what they consider to be the best feature of their digital flatbed system. The answers are quite varied but several attributes stand out from the rest. Of the 74 comments received, 24 percent of our respondents cite machine versatility as its best feature. This is followed closely by “results” which is mentioned by 20 percent of our group. We believe this is at the heart of the majority of positive comments about their systems. It’s hard to argue with good results. Additional positive attributes to note are price, ease of use, speed and dependability.

When we flip the coin over and look at the worst features mentioned by our respondents, low image resolution, slow speed and poor material handling are all tied for first place. Collectively, these three attributes account for nearly 40 percent of the negative comments. It’s worth noting that “speed” received the same number of best feature comments as it did worst feature comments. One disgruntled owner stated that manufacturers should accurately advertise printing speed rather than to continually overstate a machine’s capabilities. Additional negative attributes to note are a long learning curve to operate the system, maintenance costs and lack of features.

Who Owns Flatbed Digital UV-ink Printers?

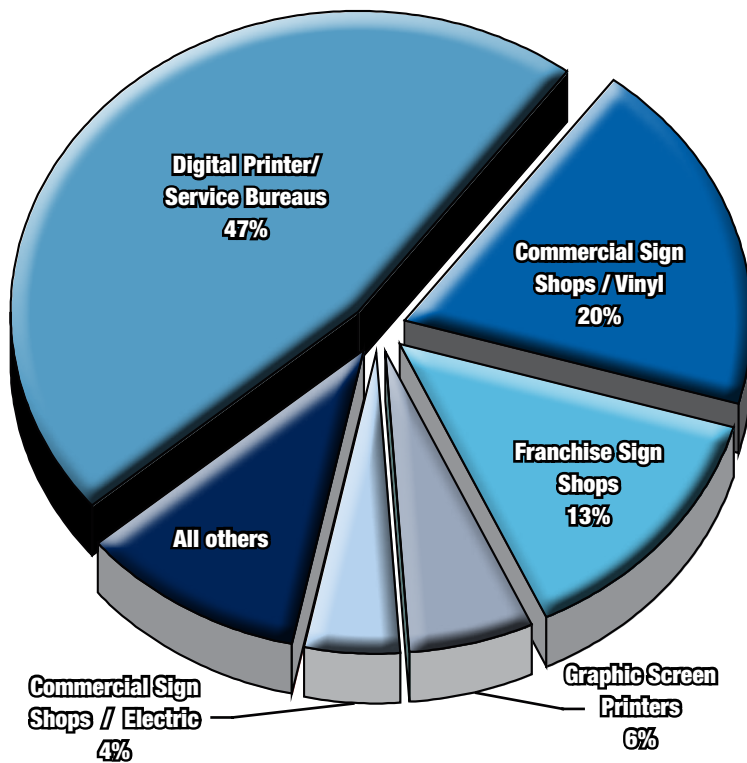


Figure 4

Most survey participants classified themselves as digital printers or service bureaus (47%) with commercial sign shops and franchise sign shops being the next most common shop.

SATISFACTION GUARANTEED?

The survey asked participants to indicate their level of satisfaction with eleven major machine operational attributes (see **Table 1**). If the respondent was very satisfied, they simply went on to the next question. However, if their response was less than very satisfied the respondent was asked to explain why they were not satisfied and to suggest ways to improve their level of satisfaction in this area.

Quality settings received the highest level of satisfaction (85%) of all measured attributes. Quality settings as defined by our survey are the ease of use and accessibility for the adjustment of quality settings. Having precise control and easy access to quality settings makes a machine easier to operate and allows the system to

perform well over a wide range of needs. The most requested improvements in this area are to have more options and a wider range of controls. Concerns were raised about the need for command-line editing in this area, and many respondents requested improved resolution settings.

Print optimization is the attribute receiving the second highest level of satisfaction (76%). Print optimization refers to the availability of test patterns to help set the optimum temperature and media feed. An unsatisfied respondent complained about poor system documentation from the manufacturer that causes difficulty in testing new materials while another claimed that the test patterns on his machine would not print well enough to use. One poor respondent claimed to never have

been told about this feature in his new printer. The most common suggestions for improving systems in this area are to provide better operator training and to improve the auto-calibration capabilities for testing different substrates.

Warm-up time is the attribute receiving the third-highest level of satisfaction (75%). Even though our respondents would like to see faster warm-up times, most seem to realize and accept that a certain amount of warm-up time is needed to preserve life of the UV-curing lamps and to stabilize operating temperature for consistent quality and performance. Suggestions for improvement include adding an auto warm-up feature that starts the process before operators arrive, and to provide an accurate display of temperature and status at the operator's station.

User interface. Approximately 73 percent of our respondents are satisfied with their system's user interface, ranking it fourth in satisfaction. It is at this point where respondents begin to be more serious about their comments. Common complaints include confusing names for print modes, lack of a batch function for processing jobs, difficulty in setting up new media, and having too many time-consuming steps to set up a job. Ways to improve the user interface include making the operating system icon-based (like Microsoft Windows), provide a constant purging option for the UV ink system, better organization of operating screen options, providing more on-board test prints, making systems more receptive to using PDF files, use of "common" terms to define functions and to provide shortcuts to access on-screen controls.

Printhead Height Adjustment. When asked about their system's printhead height adjustment, only 70 percent of our target group responded as being satisfied with this machine attribute, which puts it in fifth place. When dealing with rigid substrates, a machine must be able to accommodate a wide range of product thickness so the operator must be able

to adjust this setting as required. The most common complaint is that setting printhead height is too difficult and/or requires constant adjustment. Image quality deteriorates quickly if the head is set too high, while too low a setting may cause the dreaded “head strike.” The overwhelming majority of respondents want an automated head height adjustment system that is accurate and stable. Increasing the machine’s thickness capacity is also frequently suggested.

Ink adhesion. In sixth place on our list of eleven machine attributes is ink adhesion capabilities of UV-curable inks. This should not come as a big surprise for most readers that are familiar with UV-curable ink. While UV ink has been in use in screen printing and lithography for decades, it is a relative newcomer to digital inkjet. Without significant reformulation, UV-cure ink is not easily adapted for use in inkjet imaging systems due to its high viscosity, sensitivity to heat, and for many other reasons. The bottom line is that it is very difficult to formulate a good UV-curable ink that will pass efficiently through an inkjet printhead. Therefore, UV-curable ink used in inkjet technology is a compromise between it’s formulation

for best performance on a substrate and it’s ability to withstand the rigors of being used in an inkjet system.

Most complaints about UV ink adhesion involve difficulty with plastics such as Lexan, Plexiglas and acrylics, as well as some brands of corrugated plastic. It is not surprising that we received no useable suggestions for improving this issue. It should be sufficient to know that most ink manufacturers are continually working to improve the performance of the UV-curable inks used in inkjet technologies.

Maintenance requirements rank seventh on our list of flatbed satisfaction, and it is apparently a “bone of contention” with many respondents. Most of us in the graphics industry understand that maintenance is simply a necessary evil we must contend with. However, we often become intolerant when maintenance needs are considered excessive and product support is lacking. One person’s comments seem to sum up the group, “It’s a printer’s nightmare. Ink, solvent, and air lines constantly leak...components have shorted out... and in a 2 ½ year period, maintenance costs have been higher than the cost of the machine.”

Other problems include replacement parts not being readily available, parts are not end-user serviceable, parts are expensive, and manufacturers are slow in responding to repair requests.

Suggestions to improve maintenance requirements include making better user manuals, improving operator training, increasing quality control in manufacturing, including troubleshooting instructions with equipment, manufacturers not relying so heavily on telephone support, and reducing the need for service visits.

Head-crash recovery. Less than 66 percent of our target group is satisfied with their system’s head crash recovery, so this attribute ranks eighth in satisfaction. As one respondent put it, “Head crashes are devastating.” Head crashes can damage the head, waste production time, ruin stock and disrupt the flow of production. Our respondents suggest improving the way stock is held flat, providing sensors to prevent head crashes and to eliminate the need to completely shut down a system during recovery (perhaps a warm reboot sequence).

Media handling ranks ninth on our list with only a 62 percent satisfaction rating. Many of the concerns surrounding this problem appear to be connected with stock that is uneven or that curls during the imaging process. Our respondents want to see better methods for holding substrates. Other concerns include substrate slippage during imaging, difficulty in running maximum substrate size for machine rating, and inaccurate registration – especially on two-sided and two-up work. Many of the concerns involve hybrid systems, which require altering the media handling to accommodate roll-to-roll stock as well as rigid material.

Static buildup is at the bottom of the satisfaction list. Static control systems are not offered on many systems and with some systems it is an option; so the end user can find himself having to deal with third-party vendors for a solution to this common problem.

Table 1. Summary of machine attributes

| | Unsatisfied or very unsatisfied | Neutral | Satisfied or very satisfied |
|-----------------------------|---------------------------------|---------|-----------------------------|
| Warm-up time | 3 | 14 | 50 |
| User interface | 8 | 10 | 49 |
| Printhead height adjustment | 7 | 13 | 47 |
| Maintenance requirements | 12 | 10 | 45 |
| Quality settings | 4 | 6 | 57 |
| Print optimization | 4 | 12 | 51 |
| Head crash recovery | 10 | 13 | 44 |
| Media handling | 13 | 11 | 42 |
| UV-cure ink adhesion | 9 | 13 | 45 |
| Eliminate/reduce static | 10 | 15 | 42 |
| Hybrid capabilities | 5 | 5 | 36 |

This summary of machine attributes shows 67 flatbed printer owners’ level of satisfaction with eleven major operational printer attributes.

Controlling static during the printing process is a very common problem across the entire graphics industry. Anti-static bars, ionizing systems, grounded tinsel wire, anti-static sprays, humidity and environmental controls, and even laundry static papers are solutions printers have used for years. The bottom line in this category is that system owners are basically left to come up with their own solutions, but would very much appreciate a system with built-in static control systems.

HYBRID PRINTERS

Hybrid flatbeds refers to systems that can print on either rigid or roll-to-roll (flexible) substrates. Not all digital flatbed systems are capable of this, so this question was only asked of those who have hybrid equipment. As might be expected, many of the problems in this category are due to the need to compromise when designing a media handling system capable of being changed from one feed type to another. From the comments received, it seems as if hybrid systems handle rigid materials better than rolled substrates. If you look closely at hybrid

systems, it is not difficult to see that most are designed to handle rigid stock and then adopted to accommodate roll-to-roll material. Other than some difficulties in handling roll-to-roll substrates, the most common complaint is that the changeover is time-consuming. Many respondents' solution has been to use a digital printer specifically designed for flexible substrates, and to use their flatbed system only to image rigid stock.


WILL WE EVER FIND THE PERFECT PRINTER?

One company has! Yes indeed; one respondent has *no complaints* about his/her digital flatbed UV-curing printer. We figured this must be a mistake, so we looked through all the responses from this participant and found 100 percent satisfaction. It just goes to show you that everyone's needs are different, and this lucky person has found perfection in a current model. Unfortunately, the rest of our survey respondents are not so fortunate.

Our target group suggested more than 100 ways to move the current level of technology closer to perfection. When

condensed down to 37 basic categories the top ten are as follows:

- 1) Increase speed
- 2) Improve image resolution
- 3) Make systems more user friendly
- 4) Lower the cost of UV-cure inks
- 5) Improve ink adhesion
- 6) Provide automatic adjustment of printhead height
- 7) Allow for printing full-bleed images
- 8) Lower maintenance requirements and cost (especially cost)
- 9) Offer white ink (many do)
- 10) Make systems more reliable

It you take a moment to study this list, you will find the vast majority of complaints will be eliminated and desires will be achieved. Perhaps the perfect printer is just around the corner. But don't hold your breath. Many people realize that our needs continually increase and will probably remain just ahead of the latest level of improvements. I have a feeling we'll be searching for the "Perfect Printer" for a very long time. 

Reprinted from *Digital Graphics* 2007

© 2007 National Business Media, Inc. all rights reserved

Please visit [Digital Graphics Magazine](#) web site