FLAAR Reports

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VUTEk QS2000
VUTEk QS3200
UV-Curable Inkjet Printers

FLAAR Reports

Please Note

INTRODUCTION

VUTEk is a well-known brand in the world of grand format printers for traditional signage (banners and bill-boards). Readers of the FLAAR web sites frequently ask our advice about VUTEk brand UV printers, and how they compare with Durst Rho, Gandinnovations and other brands. Since I have visited the Gandinnovations factory for two days, have visited the Gandy demo room in Texas for a day, I felt it would be fair to do the same with VUTEk. So two visits were made this year: first for general familiarization, and a second visit for a detailed study and test printing on the QS3200.

VUTEk QS3200

A third visit will be made to study their VUTEk solvent printer that can be changed to a dye-sublimation printer. This changeover has been popularized by HP Scitex and Gandinnovations has both solutions too, so now is a good time to include these ink chemistries and technologies in upcoming FLAAR Reports.

The QS2000 and QS3200 Vutek printers are still relatively new. Using a printhead other than Xaar or Spectra or KonicaMinolta is also relatively new, so there was a lot to learn. I started the first edition of this FLAAR Report last year at the level of aa Second Look stage. At that time I had inspected the printer at three trade shows: SGIA (Las Vegas), Sign Spain (Madrid), and GraphExpo (Chicago). ISA '07 and FESPA '07 were so filled with even newer UV printers that most of our time there was on the newer printers.

So in order to devote more time on the VUTEk QS system, I visited the VUTEk factory twice, first to get a general impression of the overall company and then a separate visit for another entire day to inspect the printer in detail, to run test prints, and to ask questions and obtain answers for a new style of UV printer review that is not available at this depth elsewhere.

This is a serious printer and will require a site-visit case study to further our coverage. But I wanted to start with the comprehensive report based on testing and inspecting the printer in the main demo room and in the factory.

We have site-visit case studies of
- Two different installations of a Gandinnovations Jeti flatbed
- One installation of a Gandy Jeti roll-to-roll UV machine
- Several installations of ColorSpan UV-curable inkjet printers
- Two different installations of a Lüscher JetPrint flatbed UV
- Two different print shops with a Vutek PressVu 200/600 UV printer.
- Two different print shops with a Zund 215 UVjet
- One sign shop with a Chinese-made DuPont Cromaprint 22uv
- Two site-visit case studies of an Infiniti UV printer.

Since the QS series is new, it is not yet as readily available for a site-visit case study, so it helps to get started with what is noticeable at three large trade shows plus an intense all-day session in the VUTEk world headquarters demo room and factory. We look at a printer with an inquisitive mind, as you would expect of a university professor of digital printing.

We ask questions that they don't get from an end-user, and we often get answers that differ from what a print shop owner might be told. So even if you also went to several trade shows, we harvested a few nuggets of information and got photographic details that help better understand this UV-curable inkjet printer.

To acquire the knowledge that goes into these reports requires visiting print shops, manufacturing plants, demo rooms, and visiting trade shows (so we can compare printers all in one place over an intense several days). Our university pays none of these costs, so to make it possible to keep being able to provide educational material to our readers, we request sponsorship funding. We also appreciate it when the transportation costs to trade shows and learning venues are provided (otherwise we would be stuck on our campus like most other professors). For example, it would not have been possible to get to the factory without the company contributing to the transportation and hotel. The lack of university funding is why there are no other professors doing what FLAAR is accomplishing (a main reason is that FLAAR is independent, so we can be more innovative).

Although FLAAR is non-profit, the graphic designers who work hard to prepare this PDF for you from Nicholas's notes, and the web designers who create the web sites that attract over a 270,000 readers per year, all appreciate receiving at least a modest salary.

A small portion of our operating costs comes from selling the FLAAR Reports. But our readers don't always know what to expect, so a new agenda is to make a sample of our reports available free. So this year we are starting this new program, to request a subvention (grant) from respected members of the wide-format industry to cover the base cost of issuing the reports so we don't have to charge for them. We list every company that provides a grant in the open documentation at the end of each report that has a grant. For us, the subvention allows more people to learn more about UV-curing inkjet chemistry and technology. That's our goal: to assist as many people as possible to learn from our experience.

The larger universities with major print training programs, such as RIT, Cal Poly, Clemson, etc, receive industry support directly, especially donations of million-dollar offset, flexo, and variable-data printing presses, endowed professorship funds, research funding, etc. BGSU has no such source of income. So FLAAR has to do this kind of fund raising on our own (especially since we were working with wide-format inkjet printers for many years before affiliating with BGSU). Rather than working with Heidelberg or offset press manufacturers etc, we specifically limit ourselves to wide-format inkjet printers (plus scanners, digital cameras, and related digital imaging equipment).

During the coming six months we hope to add additional sponsors so that more of our reports can be available to a wider audience. This is especially necessary since the university has cut back so far that industry support is increasingly essential (the State of Ohio has lost so many manufacturing plants to off-shore, especially China, that tax revenues are no longer sufficient to support state-funded universities). By the time of DRUPA 2008, we wish to be completely independent of falling (and failing) state support.

FLAAR Reports on printers come in many levels, depending on how much access, time, and funding is available:

- FLAAR Fast Facts
- FLAAR Photo Essay

These two levels are what results when the only access is at a hectic trade show in a foreign country, such as the recent Shanghai trade show. In many cases, however, these FLAAR Reports, albeit brief, are the only independent documentation that is available. Everything else on the Internet is simply the same PR release regurgitated in web site after web site. We are proud that we can stand out and do not accept PR photos and don't publish the manufacturers hype.

- First Look
- Second Look
- Third Look is possible when we have access to more documentation than is available at a trade show.
- Site-Visit Case Study
- Factory inspection and demo room testing

In the Abstracts to the UV reports we try to indicate the level and date of each report. One thing it is also crucial to recognize, is that there are over 100 models of UV printers from more than 45 manufacturers. There is no way, none whatsoever, to update every single report year by year. Again, even if dated "2006" or "2005," in most cases what is in a FLAAR Report is more than what is available elsewhere.

Plus, we don't publish "Success Stories." Indeed the more Success Stories that are published, the more a FLAAR Report stands out as being meaningful. We list what is an issue, and what is missing. A Success Story is merely a PR release under the guise of being a pseudo review. There are also other kinds of sham reviews available, which actually keep us in business. Our reports are not perfect, but we do work hard to be realistic.

VUTEk QS2000 at Sign Madrid 2006

THE BASICS

1. Brand name, model?

I have seen the model name written VUTEk PV QS2000, with PV being an abbreviation of PressVu, the designation for flatbed-oriented VUTEk printers. But the word PressVu and even the abbreviation PV is missing from the official brochure. This is a good step forward. This is a good step forward because some names for other printers are simply too long.

2. If there are two or three (or more) widths of this printer, what differences exist other than the width?

Both QS printers are essentially identical other than the width.

3. What is the nature of the manufacturer? Is this company the manufacturer, distributor, or rebranding a machine made by someone else?

VUTEk designs and manufactures their own printers in New Hampshire. VUTEk has many years experience with airbrush printers, then with solvent-ink printers and for the last several years with UV-cured inkjet printers.

VUTEk occasionally OEMs the printers of other companies, such as one mid-range solvent ink model from Mutoh Europe, but the UV printers are not from Korea, definitely not from China, and are not an OEM from anyone else.

VUTEk is owned by EFI. EFI is the world's leader in software controllers for copiers such as Canon copiers. So VUTEk is the only UV printer manufacturer that I know of that is owned by a software company. Naturally there are advantages in the union between hardware and software.

VUTEk has its own ink partner, Inkware. So VUTEk is all the more unique: a hardware company that also makes its own ink.

4. What other printers are the same or similar chassis from this manufacturer or distributor?
The previous model, PressVu 200/600 shares the same transport belt and combo design concept.

5. What other printers of other brands are comparable?
Combo style UV printers are more and more common, indeed one trade magazine editor said to me, "To many of the combo printers at FESPA may be new, but what are they really other than new 'me-too' printers." In other words, there is not really that much that distinguishes one combo printer from another, until FLAAR starts its work to establish precisely what distinguishes one from another.

6. How does this model compare with comparable previous printers?
The QS series has a higher dpi than earlier VUTEk printers due to newer printheads from a manufacturer other than Spectra, Xaar or Konica Minolta. This Seiko printhead has a lower price-per-nozzle so can afford to have more nozzles. This translates to a faster production speed.

VUTEk has been making printers since the era of air-brush technology in the late 1980's. As with Keundo and many other manufacturers of solvent-based printers, the first VUTEk flatbed circa 2000 used solvent-based ink. The publications on VUTEk's history then list the PressVu UV 180/600 as appearing in 2002. The model 200/600 appeared in 2004. FLAAR has three Reports on this: an evaluation/review and two site-visit case studies.

VUTEk QS2000 factory visit 2007

Then the PressVu 320/400 appeared, based on the premise that screen printing companies wanted more speed and were willing to put up with less dpi. We spent two days with a print shop that had this printer and returned it and bought another brand of dedicated flatbed and the same other brand of dedicated roll-to-roll. In general, although this concept (faster but not high quality) was ideal for a few users, today everyone expects faster + high quality in the same machine.

The QS distinguishes itself from the 200/600 by offering white ink as an integral part of the printer. White is now included in the base cost. Plus you can accomplish sophisticated layering techniques if your graphic designer understands layers and the effect of different kinds of white ink laydown.

7. When and where was this model first introduced?
The printer was officially introduced as a working model at the autumn Paris 2006 trade show, and then at SGIA '06 in the US.

8. Is this printer mature or still in alpha-stage or beta-stage?
It has been shipping since being shown at Paris.

Alpha stage machines are not shown to outsiders. Beta sites receive the printers under NDA. The printers remain in beta perhaps 3 to 8 weeks. A beta test site receives a discount, plus lots of tech support and some free ink.

9. What is included?
Warranty, RIP, installation, tables. As you ask you get a longer list.

VUTEk QS2000 Table

10. What accessories are extra charge? Are these same or similar accessories included with other printers at no extra cost?

On some VUTEk models, such as the PressVu 200/600, the roll-feed system is a $20,000 option. So check to see whether the roll-feed system is part of the list price for the QS2000 and QS3200.

You can opt for a front rewinder and a rear unwinder if you so desire.

Warranty, RIP, installation, tables can also be extra charges. As you ask you get a longer list of options, such as a special roller-table for front and back that has ping-pong ball-like rollers embedded in it. The regular table is flat, with no rollers.

11. What other equipment is needed to operate this printer? For example, does this printer include its own power line conditioner? Do you need an uninterruptible power supply (UPS)?

A UPS unit powerful enough to keep a system as large as the VUTEk on would be rather expensive, so a UPS unit is not generally used.

12. Is it recommended, or required, to buy a spare parts kit? Or extra printheads?

The advantage of having a spare parts kit up front is that you don't have to wait for FedEx to get a replacement part to you. So when you buy a VUTEk printer, a spare parts kit is either recommended or required. The price varies from $17,000 to $20,000. Considering that a single printhead can cost roughly $3,000, you can see how the total is reached.

13. Or do the dealers prefer that customers not try to make their own repairs?

The end-user is not encouraged to take the printer apart and do repairs on their own.

This policy varies by manufacturer. Interest in doing their own repairs varies by the end-user and by the printer operator. A few operators like the opportunity to take service training at the factory and thereby to be able to do basic repairs on their own. Most manufacturers discourage this, but some manufacturers do allow end-users to take advanced service training.

PURCHASING

14. Are dealers national (most companies) or regional (Roland allows a dealer to operate only within a limited regional area)? Does a buyer have any choice in dealers?

VUTEk sells to most markets direct. Pitman and Global Imaging are also dealers. We know the key people at Global Imaging and have interacted with them for several years now. Global Imaging happens to also be one of the better dealers for medium format digital cameras, indeed one of the few pro dealers that handle all major brands: Phase One, Leaf, Sinar/Jenoptik, and Hasselblad/Imacon. Their web site is www.globalimaginginc.com.

In Europe and other countries there are other dealers and distributors for VUTEk. We do not yet know these individuals and companies as well as we know the dealers for Gandinnovations, NUR, Durst, and Mimaki, but we will try to meet them at future European events. This is because we have lectured for Mimaki dealerships and have lectured for Gandinnovations distributors in several countries as well.

VUTEk QS3200 factory visit 2007

Back end of transport belt

VUTEk QS3200 factory visit 2007

STRUCTURE OF THE PRINTER: Vacuum

15. Is there a vacuum function?
Yes there is vacuum, but one complete area. "To avoid uneven drag; it was not worth it to have different sections."

16. Is the vacuum created by simple fans, or by an air pump?
You need vacuum pumps; fans are too elementary for an industrial strength printer of this nature. There are two vacuum pumps (for the QS 2000) and at least two for the QS 3000.

17. Just Off and On? Or variable?
Variable, set in the software by percentage.

QS vacuum pumps

STRUCTURE OF THE PRINTER: Media Transport Mechanism & Media Path

18. Was this printer made originally as a UV-curable ink printer, or is it retrofitted with UV-curing? If retrofitted, what was the original brand or model?

This is the fourth generation of UV printers from VUTEk. Only the predecessor to the model 180 was derived from a short-lived solvent-based flatbed printer concept.

- 180
- 200/600
- 320
- QS

19. Is there a moving transport belt (combo style) or a stationary platen (hybrid style)?

This is a combo style printer; there is a moving transport belt and no platen.

STRUCTURE OF THE PRINTER: Transport Belt

20. Describe the transport belt? What material?

At first appearance the open weave of the transport belt looks sort of like that of the Dilli (and hence similar to that used in the Agfa version of the Dilli). But it is unlikely they are the exact same material or from the same source. VUTEk uses a custom-made belt from polyolefin plastic, covered with Teflon.

As with all such belts, it is actually a giant roll of material, stitched at one end with a strong "thread" that is meticulously taken (fed) through the end-loops by hand. The overall belt is about 5' on its top area but overall is perhaps 11 to 12' in length (if you had it off the printer).

The material in the Dilli/Agfa transport belt tends to stretch and get out of alignment after use. This may be because of the large size of the openings in the weave: too much space that allows it to flex when pulled more in one part than another.

"Belts on some other brands stretch, can be junk." We too have heard of belts of one brand that had to be replaced four times on one sign shop's printers, due to issues. We are checking this out to document the situation (was not a VUTEk printer, but from Asia).

Transport belts are also common on retrofitted Roland printers used to transport fabrics through these printers.

VUTEk QS transport belt, factory visit 2007

VUTEk QS transport belt, factory visit 2007

21. Size, does it stick out?
The VUTEk belt sticks out about 9 inches in the front and a similar distance at the back.

22. How well does this belt hold up to heavy use? Does it skew?
Heavy materials, such as MDO boards, skew on the transport belt of the PressVu 200/600. However VUTEk suggests this may also be due to poor loading. Either way, skew is the most consistent issue that I hear when I ask about this earlier generation printer, so clearly something is askew if this many people comment on it. But if you never print heavy objects, or only print objects that the transport belt happens to transport nicely, then you won't comment or potentially not even know about propensity to skew.

You can check this yourself to some degree by looking at the transport belt from either side. Have the lighting shine on the belt so that you can see the horizontal sections. What you want to see is whether the woven aspect of the belt remains straight, or whether it has shifted from stress and strain.

The best way to protect yourself is to ask, in advance, of a printshop operator who has experience with diverse materials on the QS2000 or QS3200. Simply ask if they have skew, and with which materials. Zund decided to not even try to make any more printers with a transport belt precisely because although a belt can perhaps move some materials acceptably, it can't move all materials equally well.

23. How often does the main flatbed transport belt need to be replaced? At whose expense?
All belts for all printers are consumable items. These can replaced by the end-user. One extra belt is included in the warranty. Although it seldom happens, there are two ways to damage or ruin a belt (other than gradual normal gradual wear and tear). If the carriage stalls (rare but it can happen), the UV lamps will melt the belt. Or, if by mistake you press the print button and there is no media, this might jet so much ink onto the belt that you might prefer to replace it.

24. What does the transport belt area of the printer look like under the belt?
There are two main rollers, one at the front the other at the back. In between is a rectangular vacuum bed, the same kind of bed you get on a dedicated flatbed printer.

25. Which is the drive roller for the transport belt (where is the motor and what kind of motor turns the transport belt)?
Over the last year, the most common complaint on many brands of UV-curable combo-style printers is that their transport belts slip. This was a major issue with DuPont Cromaprint 22uv until they totally changed their belt: one user had four replacements (lots of down time). We just received information of significant failure of the belt of the GRAPO system (it was "wandering"). Skew has been an issue on the VUTEk 200/600 combo belt as well. In most cases it tends to be heavy material, including MDO boards.

As a result, FLAAR has begun to pay special attention to the drive mechanism and to the material out of which the belts are made. We are checking to see which belts have added tension and/or alignment rollers in addition to a drive and driven roller pair (the front and back rollers). So far we have found one very sophisticated transport belt system, on the IP&I Cube (both models, 260 and 1606). Since this is a topic of increasing pertinence, we will update this section of the report as new information becomes available.

LINING UP FLAT MATERIAL (to help it feed straight)

26. How is rigid media fed?

Rigid material starts off on the roll-up table at the back; is carried by the transport table, and lands on the front roll-up table at the other side.

VUTEk QS back table

VUTEk QS3200 roller across front

VUTEk QS3200 roller across front

27. What kids of raised guide bars along the side of the table exist? Left or right? How long?

No raised bars alongside any tables. There used to be, on the PressVu 180 model years ago. But most boards for signage are not cut squarely by the manufacturer. We hear this problem from all print shops; the sign boards are unevenly cut. So VUTEk feels it is safer to line boards up at their front end only.

28. Is there a registration gate that is lowered across the back printing area?

Two bars: one fence and pressure bars. Raise the bar and drop the fence.

29. Does the drop-down gate have moveable features to assist in registering materials?

Yes, you can move the shims.

30. Does the drop-down gate have features to facilitate placement of multiple small materials against it?

Yes, the drop down gate does (you can add an auxiliary shim that has a corner-registration feature). But there is no side-guidance feature like on the ColorSpan 9840uv. The earlier VUTEk model 200 was the first model with a fence, but this earlier model does not have the software to go together with the customized placement of the shims. You can retrofit the model 200 to take the shims, but not its software.

31. Is two-sided printing realistic? Is there a special mechanism for registering the position of the image on the second side?

There is a simple but clever system for two-sided printing. Just flip the board over (after it is printed on one side) and instead of aligning it to the left, align it to the right edge.

32. Do you have to hand measure the media height, to enter it manually into the software?

The carriage has a drop-down "foot" that is a spring-loaded bracket. This measures the media height. This should be considered manual.

33. Do you have to measure the media size (width and length) manually and then enter it yourself into the software?

Yes, you must tell the software. The earlier model 180 had lots of sensors for things like this but VUTEk felt that the operator could better control aspects such as this.

FLATBED ASPECTS (for dedicated flatbeds)

34. What kinds of pin registration are present?

Pins are not usual on a combo system. Pins are found primarily on a dedicated flatbed such as Gandinnovations, NUR or Lüscher. A combo design such as that of VUTEk tends to have a drop down gate or "fence."

35. Does the printhead carriage move across the widest dimension of the table (like Gandy Jeti or Oce 250), or across the narrow dimension (this is how Inca does it)?

The printhead carriage on most combo printers moves across the widest dimension of the table that is hidden under the combo transport belt.

ROLL-FED

36. How is media held flat? Vacuum table? Pinch rollers?

Media is held flat by a combination of the vacuum and two long press-down rollers. One large metal press-down roller is across where the material feeds in, roughly under the carriage rail; the other is inside the entrance at the output side (the front).

Such press-down rollers are approximately the equivalent of pinch rollers; the transport belt is the equivalent of the grit rollers.

QS vacuum table

37. Are the pinch rollers same size as grit rollers, or smaller?

The two pinch rollers are the full width of the carriage and about 4" in diameter, of an aluminum-like material.

38. How is the roll held at the feeding position? On a spindle? On a saddle?

On a spindle.

39. How is the roll media handled at feeding position? For example, is there a dancer bar?

No dancer bar, no tension bar system.

40. Is the feeding area for roll-fed material physically attached to the printer or is it out in front and not attached (as on the GRAPO Octopus).

Roll fed media system is physically and permanently attached to the printer (if you ordered this option to begin with).

41. If a combo system, does the media feed directly onto the transport belt or is there an inter mediate roller bar out in front?

No, there is no intermediate roller bar out front; it's absence is not considered a negative point.

42. At the back, is there an extra roller bar(s) near the platen or transfer belt? Is it a bar to roll under the media, or over the media, or are there both (in addition to pinch roller/grit roller arrangement).
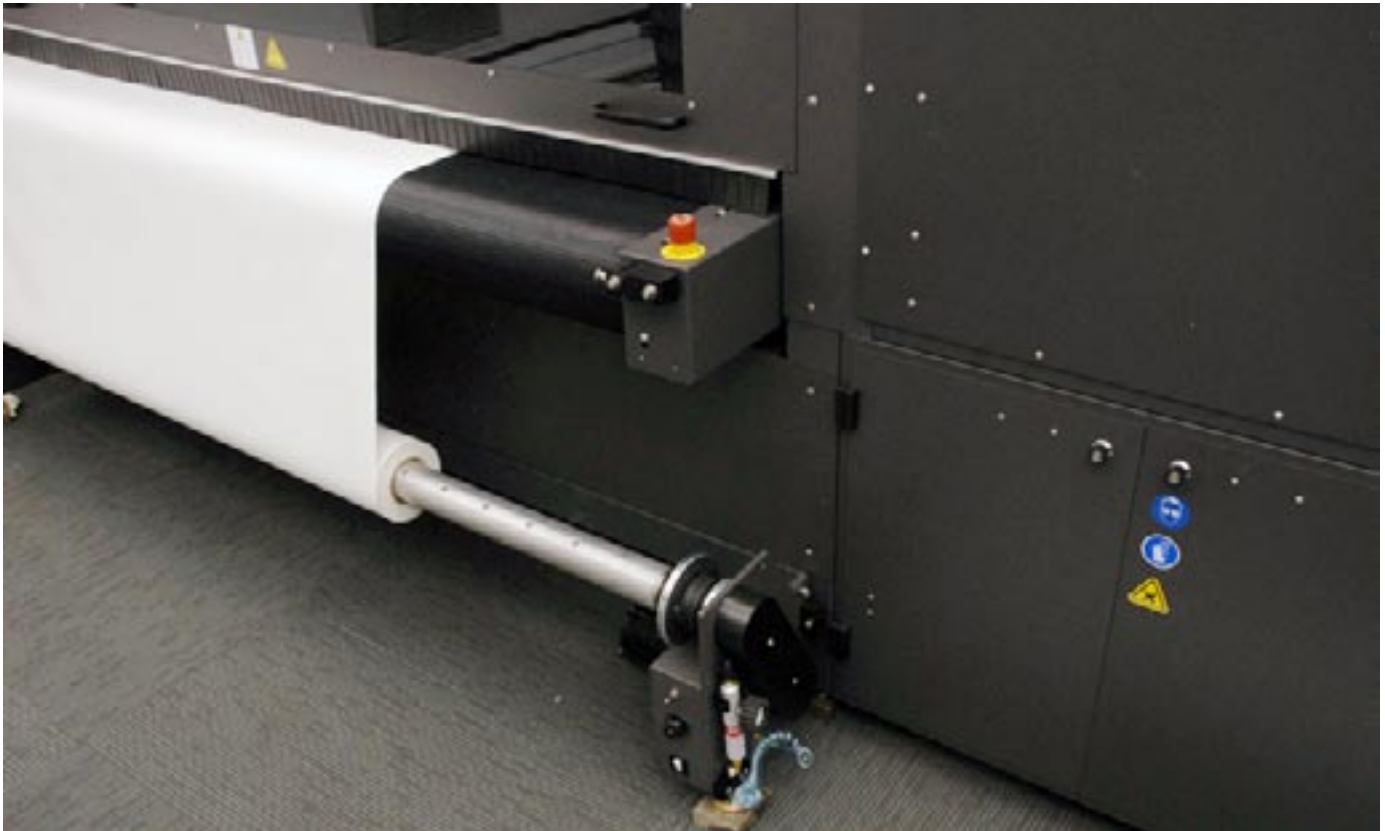
No.

VUTEk QS roll fed

43. How is the roll media handled at feeding position? For example, is there a dancer bar?
When I asked about dancer bars, I was told "The VUTEk model 180 had dancer bars. But these are not necessary when using a saddle." However the QS does not have a saddle.

VUTEk QS2000 roll fed

44. Describe the overall path of the media through the system?
The path of the media is simple: up, over (the transport belt) and down.

45. How much media is wasted during loading and feeding?
With some other brands of printers you suspect that they are deliberately designed to waste ink and media since this is how those companies get their profits. Media is moved too far out, media is wasted before and after cutting, etc. That is not generally the case with a manufacturer that does not sell media.

46. Can you print on more than one roll of substrate simultaneously?
Being able to print on several different rolls of material simultaneously is common on grand format solvent-based printers but almost unknown (and unavailable) on printers less than 104 inches.

STRUCTURE: Miscellaneous

47. Does the printer have leveling supports? How many, and how strong?

There are four main leveling supports; the side cabinets hang from the main structure; they do not rest on any ground support.

Wheels do not ship with a printer; wheels are used only in a demo room.

Leveling any UV printer is crucial. Indeed at the NUR factory, once the structure is leveled in the assembly room, rather than roll it from stage to stage, all construction stages take place with the printer not moving from stall to stall.

TABLES for Combo or Hybrid Flatbed

48. What is the design of the take-up table?
> ### • Horizontal roller bars the full width of the table?
> ### • Horizontal roller bars with rigid supports in the middle and/or elsewhere too?
> ### • Separate flat bars with rows of tiny rollers?
> ### • Solid flat table with small roller bars?
> ### • Solid flat table with ball bearings?
> ### • Another design?

Some kinds of feeder take-up table (the table after the rigid material comes out of the printing area) may cause a warped piece of material to snag against the roller bar. So the design and implementation of the take-up table is something you need to understand. Both DuPont and Oce changed their roller-bar system for a solid table (DuPont added ball bearings).

VUTEk QS2000 table with ball bearings

Ball bearings

The current generation of VUTEk tables are flat and solid: no rollers, not even any ball bearings. But if you prefer a table with rollers, a roller table is available as an option. Tables with rollers cost more than plain tables. The tables with rollers are needed to handle very heavy materials such as glass or stone or even 1/2 inch Lexan. Some of these materials at 4x8' size can weigh over 100 lbs.

49. Are there only two legs (at the front) or are there four supports?
There are only two legs at the front. The back has no legs; it is attached to the printer body.

50. Do the legs have wheels, or leveling system, or both?
The supports have levelers at the base of the legs, but no wheels. When the table is in use the wheels are raised up.

51. Is the table physically attached to the printer? Or just rolled up close to the printer?
The tables are intended to be fastened securely to the printer with strong brackets.

QS2000 table

52. Does the table fold up and wheel away folded up?
Yes, the table can be folded up and relatively easily moved.

VUTEk QS3200 table unfolded

53. How much weight can the feeder-table or take-up table hold?
"Heavy duty, can take at least 150 lbs."

54. Are their edge alignment bars on the table? At left, or at right, or both?
The tables have no alignment bars on either side.

UPGRADES, Future Improvements?

55. What features have been added, or changed since the printer first appeared?
Nothing major added since the printer first appeared.

56. What features are being added, or changed in the next month or so?
Remote diagnostics were at one time stated that they will be available in the future. But as of summer 2007 this feature is still not activated.

57. What firmware upgrades have been made available?
One or two firmware upgrades are typical for the first year of a product.

Miscellaneous

58. What moves:
- **the flatbed platform,**
- **the printhead area,**
- **only the material (fed by roller table; then gripped and fed by the printhead area mechanism as on a regular printer; or both?**

For example, on the Inca Columbia the flatbed itself moves in and out for every line of print. The 3M (Leggett & Platt) machine is unique in that it has two options for movement, both the material and the head assembly in X, Y directions.

59. If the objects you are printing are not as wide as the full width of the printer, does the printing carriage still have to cross the entire space, or can the printing assembly hover just over the area of what has to be printed (and thereby be a bit faster?).

Yes, most sophisticated printers can hover. But this may cause too much heat build up over one part of the printer. So your software also needs to be able to modify the hovering position if so desired.

60. Is there a light inside when you open the hood?

No.

OPERATING THE PRINTER

61. Can the operator manage print jobs via the Internet with this printer?

You can potentially check on the printer but you can't operate it remotely.

62. What sensors does the printer have?

Compared with other UV printers the 200/600 does not have many sensors. Measuring media height is mechanical, for example.

63. Which materials are pre-established in the software, or do you have to create the settings for each class of material yourself?

VUTEk has carefully avoided pre-establishing materials in the software in part because quality of materials varies greatly by the manufacturer of that material. Material quality also varies considerably by country.

64. In the main area for operation, is the machine software based (touch screen), or with physical control buttons? Or both?

You do everything on the keyboard. There are not really any control buttons at the front. "VUTEk does not use a touchscreen system since you may have ink on your hands."

The system is Linux based.

VUTEk QS3200 Monitor and Keyboard

65. Do you get an LCD screen in the printer or a real computer monitor? How big is the screenor monitor?
You get a real computer monitor, albeit of modest size, estimated 15".

66. Is the position of the LCD screen or monitor user-adaptable?
Perhaps you can achieve a bit of adjustment in the angle, but not really much.

VUTEk QS3200 Monitor

67. Can you do unattended printing? For how long? How about overnight?
VUTEk appropriately cautions against unattended printing.

68. How many operators or operator assistants does this printer require?
One.

69. Where does the computer keyboard sit?
The keyboard is on a thick ledge that sticks out about 8" from the body of the printer.

70. Is there a drawer under where the computer keyboard is (a drawer for storing odds and ends)?
No drawer; only an open area.

71. Where does the operator stand or sit?
Front right.

72. What aspects of the printer can you operate from behind (the loading area)?
There are four buttons on the back side, including controls to operate the "fence" so you can start printing from the back, "like at a sawmill." You load the logs at the back of the sawmill, not the front where the finished boards come out.

73. What controls are on either end?
There is a DVD player and disk slot (for sizes of disks used in the 1990's) at the right end; nothing at the left end.

74. Is a foot pedal included (for operating aspects of the printer)?
No foot pedal is visible.

CONSTRUCTION (BUILD QUALITY)

75. When designed, what is the life-span that each part is tested for?
There is no specific life-span test.

76. What kind of testing is done in the factory of the incoming parts?
Spot-checking.

VUTEk QS2000 assembly, factory visit 2007

VUTEk QS2000 structure, factory visit 2007

VUTEk QS2000 structure, factory visit 2007

77. What is the solid-ness of the construction of the outer body? Is it plastic? Metal? Heavy gauge?

Printer appears solid. This fact will need to be documented by a site-visit case study after these printers have been out and in use longer.

78. Is there both a front hood and a back hood?

 Yes.

79.The hood, is it strong, or cheap plastic?

Strong enough.

80. Does the hood have a frame?

Yes, both the front hood and back hood have frames.

81. Is the frame plastic or metal?

Metal.

82. How would you describe the overall workmanship of visible parts? Clean (Swiss made), or flimsy and uneven (several Chinese-made printers)?

Workmanship is clean.

83. Does the printer wobble back and forth when printing?

No wobble.

84. After you have used the printer for a while, do screws begin to shake free?

Screws began to shake loose from an Infiniti UV printer that we have inspected several times. But you would not expect this of a VUTEk printer.

85. After you have used the printer for a while, do parts quickly wear out, break off, wobble, or malfunction?

When you buy the printer you also buy a spare parts kit for parts that will tend to wear out during the first year, including an electronics board.

AESTHETICS

86. Can you easily distinguish which is the "front" and which is the "back'?

Yes, you can distinguish the front because that's where the monitor and keyboard are. Otherwise the front and back of the printer look pretty much the same.

SET-UP OF THE PRINTER: PRACTICAL CONSIDERATIONS

87. What is the delivery time, between the time I order the printer and it is delivered?

Depends, can take 10 days.

VUTEk QS2000 ready to ship

88. What are the electrical requirements of this printer? This means, will the building have to be rewired.
1-phase 70 amp, 200-240 volt system is needed.

89. Do you need to budget installing a ventilation or room exhaust system?
All UV printers need room ventilation, for everything from ozone to misting ink to general odor.

90. Are there any special temperature or humidity requirements or preferences of this printing system?
68 to 85 degrees F; 20 to 29 degrees C.

20% to 80% non-condensing.

91. What is the connectivity? Network, SCSI, FireWire, or other?
Gigabyte network connection.

92. What is the size and weight of the printer?
61 inches high; 1.549 meters.
171 inches wide, 4.343 meters, including input and output tables.
55 in, 1.297 meters deep plus 18 inches on each side for media handling.

93. How many boxes arrive?
- 1 for the printer
- 1 for RIP station (if this option was ordered)
- 1 for ink (in those countries where ink has to be separate)

VUTEk QS2000 ready to ship

INSTALLATION OF THE PRINTER

94. Can you install this printer yourself?
The printer rolls out of the box fully assembled. Just remove the packing materials. But you do need a technician to do the initial set-up.

95. How many manuals are available?
- VIP Guide (pre-site)
- Service Guide, QS Series, for operator
- Operator manual, "User's Guide"
- RIP manual

96. What is the rating of usefulness of the User's Manual and other associated materials?
This User's Guide appears to be better than earlier VUTEk manuals in that the manual for the QS Series is dedicated to this series. In the other UV manuals the guide coverd many different printers so often had information that is not of immediate use to any one specific model.

97. Is the Service Manual for the end-user or only for tech-support?
Yes, the end-user can obtain the Service Manual, plus there are classes available for training the end-user to each this point.

I like this idea, because several operators have told me that they prefer to do as many repairs themselves as possible. Some printer manufactures, however, are of the totally opposite position: they do not want their end-users to get inside the printer.

It really depends on the end-user. If properly trained, an operator who uses the printer all year ought to be capable of being trained just as much as a tech support person who does not actually use the printer all day every day.

98. What is the native language of these guides? Is the translation acceptable?
Manuals come in
- English
- French
- German
- Spanish
- Italian

The control screen comes in other languages too.

99. Is installation included in the purchase price?
Yes.

100. How many people come for the installation?
For a normal installation now that the printer is out of beta, normally one field engineer.

FLAAR Reports

TRAINING

101. Is training included in the purchase price? If so, what kind of training is offered?
Yes, training is included.

102. Is factory training available?
Yes.

103. What on-line training is available?
Training videos are available but not specifically on-line training.

104. What about follow-up training after you have had the printer a month and know enough to ask better questions?
Three levels of training are available; the first level comes with installation.
- Operator's class
  - Ripping
  - Printing
  - Basic maintenance
- Advanced maintenance class
- Color management

People are allowed to be re-trained, so seemingly VUTEk is not stingey with training.

105. What expenses do you have to pay relative to training? Is training at your site (so you have no transportation costs) or do you have to send your people to be trained at the manufacturer (you have to pay airfare, hotel, and meals)?
You pay airfare but VUTEk pays hotel and meals.

106. Realistically, what expenses must you incur for the installation, such as a fork-lift truck or crane to lift the printer off the truck?
You will not tend to need a crane unless the printer is being installed in an upper floor. But you will probably need to hire a rigger. "It is not normal for a print shop to try offloading the crate on their own."

107. What is setup of the printer like? How many people are required to be provided by the end-user to help for setup?
For beta installations perhaps two people would handle that

108. Between the day the printer arrives, how soon is it realistic to achieve full productivity?
In theory by the third day of install. To learn the actual statistics, a site-visit case study is essential.

TECH SUPPORT & WARRANTY

109. What is the original warranty period?
One year warranty comes with the printer.

110. Does it include parts, labor, printheads?
Three printheads are in the spare parts kit for the first year. Need to ask if this is in the spare parts kit that you buy.

After that, there are three printheads per warranty (per year).

111. What is wait time to speak with a support technician? What are the hours of tech support?
VUTEk lists tech support as available 24 x 7.

112. Can the manufacturer remotely diagnose the printer?
This will be possible in the future.

113. What is the native language of the tech support person?
Since this is not a printer made in a distant foreign country, the tech support engineers speak English, not a translated language that is not always realistic to understand. The language abilities of tech support people is a serious issue, since not all "English" is understandable.

That said, we hope that tech support is also available in major languages such as Spanish, German, etc. In the past I remember reading (about five years ago) that VUTEk site preparation was done exclusively in English. If so, that would be a demerit in our multi-national world of today. Being multi-lingual is crucial, either out of thoughtfulness or simply being a good business decision.

114. Are dealers national (most companies) or regional (Roland allows a dealer to operate only within a limited regional area)? Does a buyer have any choice in dealers?
Global Imaging Inc and Pitman are dealers in the US, in addition to VUTEk direct. But no matter where you buy the printer (in the US at least), service is direct from VUTEk.

115. Who does repairs? Dealer, manufacturer, distributor, or third-party?
Both: some is direct from factory, some is a licensed third-party?

CLEANING & MAINTENANCE NEEDS

116. How is head cleaning accomplished? Spray, vacuum, manual, other?
Vacuum purge. There are various intensities of purge, such as a Quick Purge or a 12-second purge. You may have to purge up to three times.

117. To initiate a purge, where is the control or button? Is it software generated or do you have to press a button? Is the button on the outside of the printer, or inside on the carriage?
Software, not manual. It is Chinese-made printers that tend to be manual.

118. How many levels (strengths) of printhead cleaning (purging and/or sucking) can be accomplished via the firmware (software)?

A "quick purge" is 3 seconds. This may not be enough for the first purge at start-up in the morning. You can set a stronger (longer) purge of 5 to 15 seconds. At start-up a 10-second purge is recommended. You may need to do this twice.

119. Can you select which ink lines/printheads to purge, or can you only purge in clusters or all or nothing?

You can purge each ink line separately if desired, but in the morning you want to purge all heads simultaneously.

120. Is there a capping station?

Sort of, but the caps ("purge wide pads") do not seal onto the printheads; there is a short distance between them. "These purge wipe pads go up to just below the jets to vacuum clean them. This is so the operator does not come into physical contact with the nozzle plates."

This is very different from cleaning other brands of printheads, such as Spectra, where you physically wipe them with a wiper+solution.

121. Where is the parking area, "home?"

At the left.

MAINTENANCE

122. What daily maintenance is required at start up in the morning?

- Specific cleaning as indicated in the manual.
- Purge each color to get rid of the head conditioning liquid.
- Wipe the printheads with a wipe moistened in approved cleaning liquid
- Do a test print.

In general allow about 30 minutes in the morning.

123. What daily maintenance is required if you print the entire day long?

Every two hours you need to wipe the nozzle plates with the wipe moistened in the approved fluid.

- Every 8 hours you need to clean and lube the carriage rails. Put 3-in-1 oil on a rag to wipe the top and bottom of the carriage rail

124. What other periodic maintenance is required by the operator?

The User's Guide lists what you need to do weekly, such as cleaning, lubing, inspecting, etc.

Monthly cleaning is estimated to take 90 minutes.

Quarterly cleaning is estimated to take 90 minutes also.

Semi-annual training takes three hours.

125. What maintenance do the UV lamps require, such as cleaning the quartz?

The quartz does not need to be cleaned frequently, perhaps monthly.

126. What is the most delicate, or complex, or time-consuming cleaning or maintenance chore?

"Because the quartz is delicate, and because you have to take the lamp housing off," cleaning the UV lamp quartz could be considered a delicate cleaning chore.

127. What areas of maintenance are hard to access or hard to accomplish?

The end caps of both ends of the overall printer pop off, so there is not really any major area that is hard to reach.

128. Is there a sleep mode? Should the machine ever be turned off? Does this entail having a UPS unit to guarantee it is on all the time?

The printer is best kept on all the time.

129. How long can the printer sit unused?

If unused over an hour you need to purge the system before using it again. This explains why so much waste ink accumulates.

SAFETY & HEALTH CONCERNS

130. How many emergency stop buttons are there? Where are they located?

There are four emergency stop buttons, on the flat surface at each side of the hood; two at the front; two at the back.
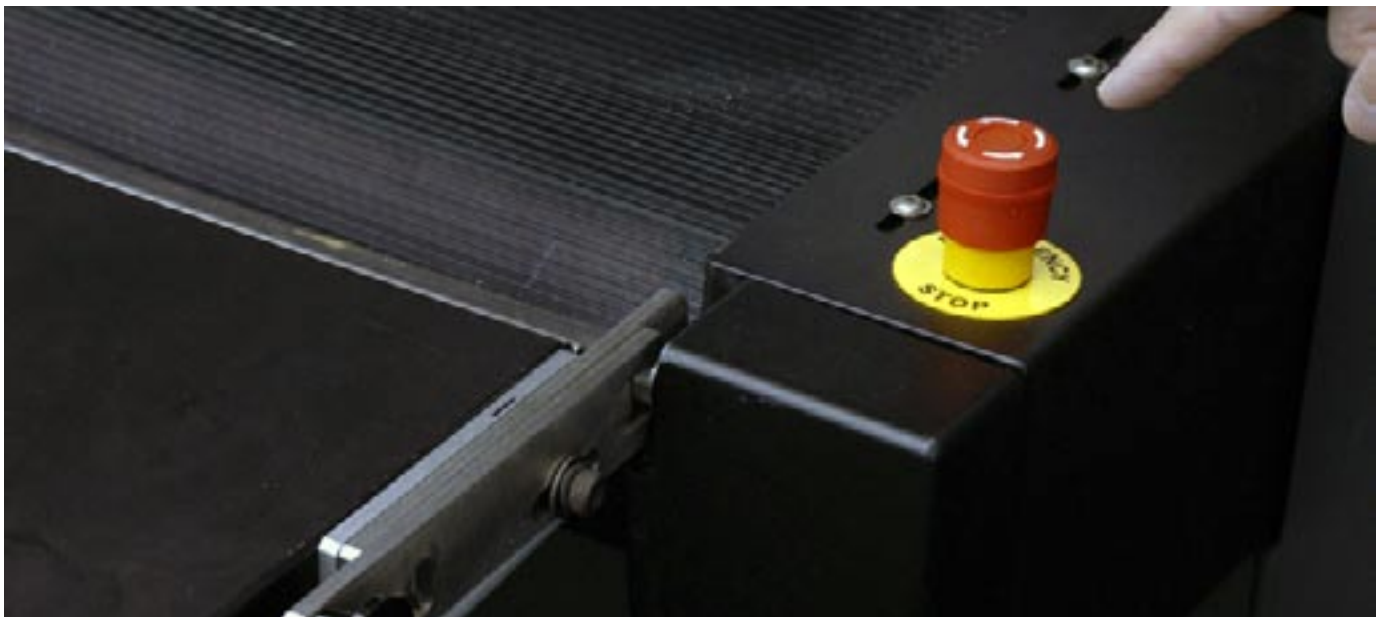
Emergency stop button

131. Is there auto-shut down? If so, what triggers it?
The hoods have safety interlock; if you open them while the printer is functioning, the printer shuts down.

132. Is there auto-shut down if the operator sticks their hand into the system while it's operating?
"Your hand would hit the roller and not really be able to get under the ink or under the UV lamps."

133. How much ozone is produced?
"Trace ozone perhaps."

134. Is there any ozone suppression system inside the printer?
No.

135. Is the machine enclosed, or exposed?
Enclosed.

136. Does the hood close down completely to seal the system, or are there a few inches open at the bottom?
The hood on any hybrid or combo system must allow space for boards to pass through, so it's hood can never close down tightly onto the platen area. The design must allow space; this space should be closed off with a skirt. Some printers use flaps or rubber like material; other printers use skirts of brush-like material.

137. What kind of "skirt" exists along the bottom of the hood to prevent light leakage?
2" high rubber-like flaps; the flaps are overlapping (an excellent concept).

138. Is there a skirt at the back as well as at the front?
Yes.

139. What system of ventilation or exhaust system is built into the printer? Or if not required, what would common sense dictate? Is it adequate to clear the work area of gasses and fumes?
Two 10" ducts are on the top, 1500 cfm.

140. How easy is it to obtain the MSDS of the ink?
It is rare that the MSDS of the ink is easy to obtain. If the MSDS is an auto-download from the company website, this is how it should be. But most companies do not wish the end user to know which brand of ink is being used, so hiding the MSDS is not necessarily an attempt to hide the dangers, but may be to hide the source of the ink.

141. How is the UV light shielded so it does not burn the eyes of the operator? Does operator have to wear safety glasses?
"Safety plexiglass."

142. How do users know if they are allergic to the non-cured ink?
As with all chemicals, allergic reactions can take many forms. But people we have spoken with indicate that if you spill non-cured UV ink on your skin, if you are sensitive, you will notice it quickly (and painfully). But even if you do not react immediately, you do not want to have UV ink or the flush for UV printheads on your skin.

PRINTHEAD TECHNOLOGY

143. What brand printhead is used?

The QS2000 and QS3200 are among the first printers to use Seiko printheads with UV ink. Their cost per nozzle is about the same as a Spectra head. But their size and special features offer benefits.

Seiko is catching up and their heads are not widely used. Seiko itself does not use them in their solvent inkjet printers (HP Designjet 9000s, the rebranded Seiko ColorPainter 64S). The only UV-curable inkjet printer that I am aware of that tried to use Seiko heads is the Bulgarian company that showed a non-functioning UV printer at FESPA 2005 in Munich. The printer's brand name was PIT. This printer never reappeared, but that is because the manufacturer was new in this field. The heads used today by VUTEk are certainly different than heads being experimented with in 2004 and 2005.

A company as large as VUTEk can obviously select whatever heads it finds optimal so the choice of Seiko clearly was based on considerable comparison of all the other potential heads. And, if you need small text rendered with minimum edge splatter and good edge definition, then this head certainly seems admirable.

VUTEk reports that they are completely content with the Seiko printheads.
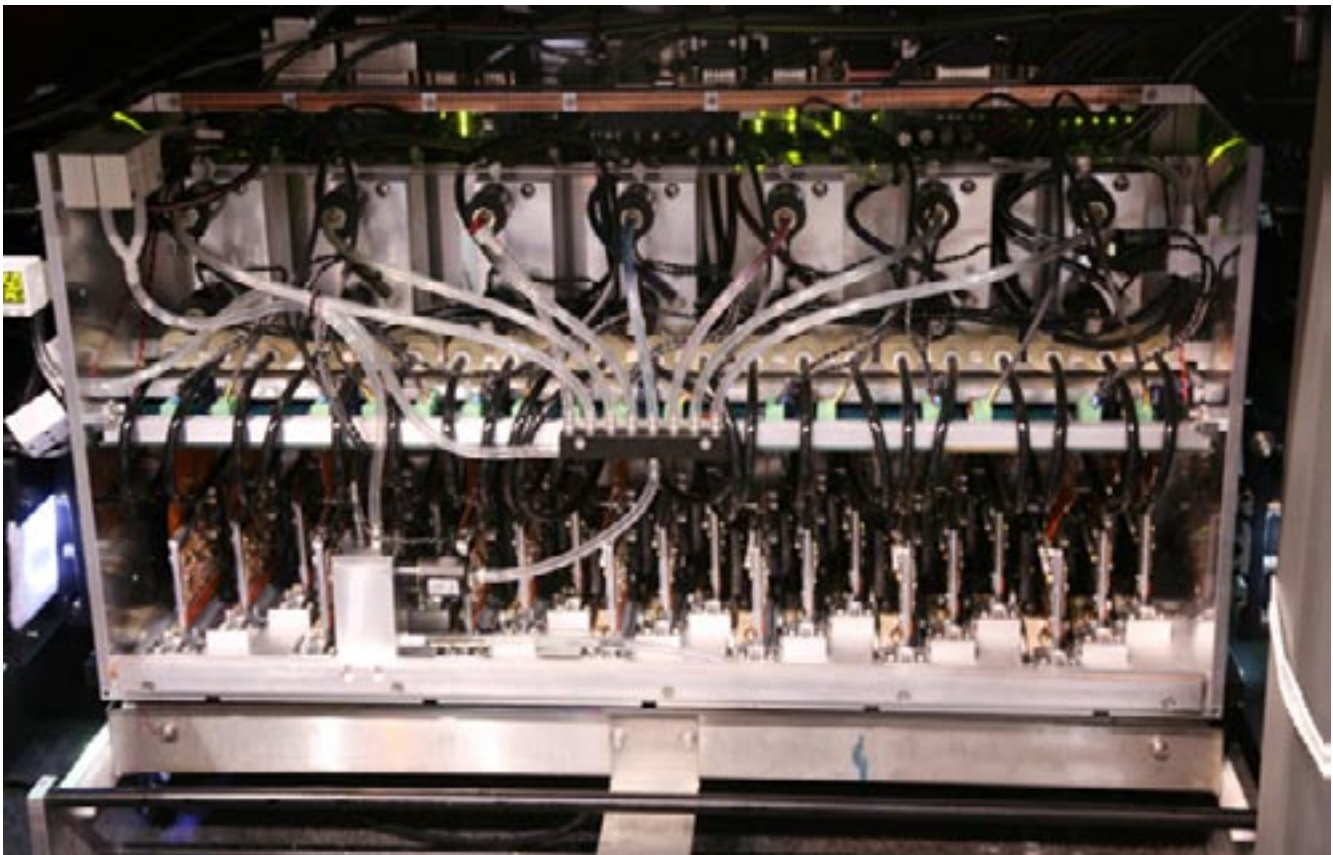
Printheads of VUTEk QS2000 at Sign Madrid 2006

144. Is the printhead identified in the spec sheet brochure by brand or also by model, or not at all?

The basic spec sheet provides no details on the printheads but at the booth you are openly told which printhead brand is used. The different models of Seiko printheads are not well enough known for the model designation to be meaningful to the average print shop owner.

145. How many other printers utilize the same printhead? Have they shown any problems?

This is close to the first time this particular printhead has ever been used in a UV printer. Otherwise, this head is utilized in the new Roland AJ-1000 (solvent) and the DuPont textile printer (slightly different model).

146. How many nozzles per printhead?

510.

147. Can a sensor(s) detect clogged nozzles and can software provide backup nozzles to cover that missing area on the next pass?

No, the ColorSpan is one of the few UV printers that does this (with Ricoh printheads).

148. How many printheads per color?

Three, this group of three printheads is called a jet pack by VUTEk.

149. How many total number of printheads?

21.

150. What is the position of the white printheads relative to the rest? Are there two printheads for white, and are they separated so one can print before, and the other after the regular colors have been printed?

Yes, the position of the white printheads accommodates various printing sequences for the white ink.

151. Are printheads arranged in a cluster, or in an array?

Staggered.

PRINTHEAD DPI & Features

152. What is the drop size in picoliters?

31.

153. Is there variable droplet capability?

No.

154. What is the nozzle spacing?

My notes read 180 dpi.

VUTEk printheads as they arrive to be added to the printer in the factory

VUTEk printheads

VUTEk printheads

155. What is the advertised DPI, and is it true dpi or "apparent" dpi? How is dpi presented (with what adjectives)? How is this dpi calculated? What is the true dpi of this print head? If the spec sheet uses the concept of "perceived dpi" or "apparent dpi" how they calculate perceived dpi instead of true dpi?

DPI is stated to be 1080 which is unlikely to be the physical dpi of the printhead. But since there is no industry-wide accepted definition of dpi, most printer spec sheets list the accumulated dpi from many passes. So a 540 dpi print head at multiple passes becomes a 1080 dpi print. But the original dpi could easily be 270 dpi with multiple passes to achieve 540 and even more passes to achieve 1080. So you need to realize how speed and resolution quality interact. Fast speed = lower quality. High quality means slower speed.

156. How many passes can this printer achieve?

Only a few printer spec sheets list the number of passes. It is more common to use modes to avoid listing passes. So this printer offers "quality levels". To achieve better quality on text you can select light smoothing or heavy smoothing. You will need to check to see how this affects overall speed.

157. Does the software use passes or modes to describe quality levels?

Increasingly most printer companies are not listing the passes that their printers run back and forth. The definition of a pass is not consistent in any event: FLAAR defines a single pass as the movement of the printer carriage, while jetting ink, from one side of the machine to the other. There is a difference between "single pass" and "one pass" but that needs an entire article (one pass means a page-width row of non-moving printheads).

Mutoh describes one pass as a complete back-and-forth movement (FLAAR defines that as two passes).

Most printer manufacturers would rather avoid having to state clearly how many actual passes it takes to achieve specific quality levels. So they create "modes" that are a combination of passes and possibly other features that result in a specific quality level.

Bi-DIRECTIONAL VS Uni-DIRECTIONAL PRINTING

158. What is the direction of uni-directional printing? From right to left, or left to right; or both?

Left to right.

159. Is the sequence of ink color laydown the same coming and going? (rare). Or is the sequence of colors bi-directionally a different sequence than uni-directional? (the usual way).

The answer provided was that "EFI software smoothing algorithms removes this issue." But some printers, such as the DuPont Cromaprint 22, arrange the heads and ink lines so that the sequence of colors is identical whether coming or going.

160. Is printing bi-directional or uni-directional? What are the different results in speed; in quality?

"We use bi-directional even at trade shows." This is admirable, and a plus point, because most printer manufacturers sort of cheat at trade shows and print only in uni-directional mode. This is not productive enough speed for real life printshops.

161. Which materials really ought to be printed at the uni-directional mode?

A four-color black may need uni-directional mode on some materials.

PRINTHEAD Positioning

162. Are the printheads in a straight row, or staggered?
Staggered.

163. Do you raise the heads manually, with click stops, or motorized?
Automatic height raising.

164. Is there an alarm system to stop the head from hitting substrate if head is not high enough?
During set-up there is a mechanical measurement that will stop the head. This is a situation where a site-visit case study, or demo-room or factory visit is needed to see this step by step.

165. How is the nozzle plate protected? Is it recessed?
Slightly recessed. "These are top-loaded heads, so easily serviced."

PRINTHEAD: Associated Features

166. Is there a heater associated with each printhead?
Yes.

167. Or is the entire plate heated and thereby some heat gets to the heads?
The plate is heated mainly on cheaper printers. On this higher quality printer the plate itself is not heated.

168. Is the temperature user variable, or fixed?
User variable.
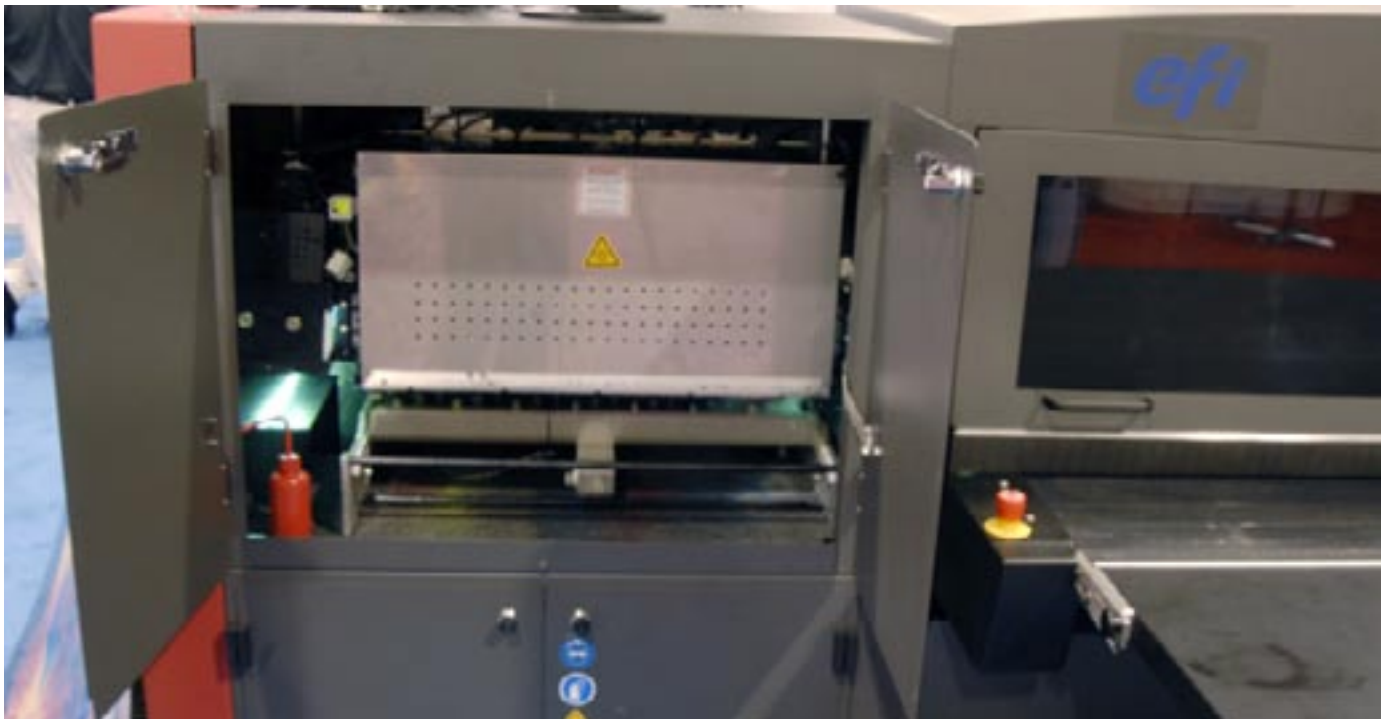
Printhead area, VUTEk QS2000 at Graphics of the Americas 2007

169. Can the firing frequency be varied by the end-user?
Not generally.

170. Is negative pressure required to maintain the ink (without the ink dripping out the printhead when the machine is turned off)?
Yes.

171. Is the negative pressure user variable?
Yes, changes in altitude cause need to vary the negative pressure more than changes in temperature do. So in Mexico City you have to correct the negative pressure for that altitude.

172. Are there problems of air getting into the system?
Don't let the ink bag get empty.

PRINTHEAD Life Expectancy

173. How often can you expect head strikes? What causes them? Who will replace the printheads and at whose cost?
"These heads are fairly robust" means that a head strike may not cause a head failure at the first strike.

174. What else, besides a head strike, can cause a head to fail prematurely?
"So far very reliable."

175. What does each printhead cost to replace?
$2500.

SUBSTRATES

176. What sizes of material can be printed on?
80 inches, 2 meters on the model QS2000.

126 inches, 3.2 meters on the model QS3200

177. Can you adjust the rate of media feed?
Yes, indeed you need to adjust the rate of feed to remove banding lines caused by media feed that is slightly off. This is not the fault of the printer but a result of the fact that each different kind of material feeds slightly differently.

178. What thickness can this printer handle?
2 inches, 5.08 cm.

179. What materials does the manufacturer list?

A VUTEk White Paper dated 2005 lists the following materials

- Pressure-sensitive vinyl
- PVC (flexible)
- Styrene/ABS
- Polycarbonate/Lexan
- Foam/corrugated board
- Card stock/paperboard
- Metal
- PVC (rigid)
- Polyethylene
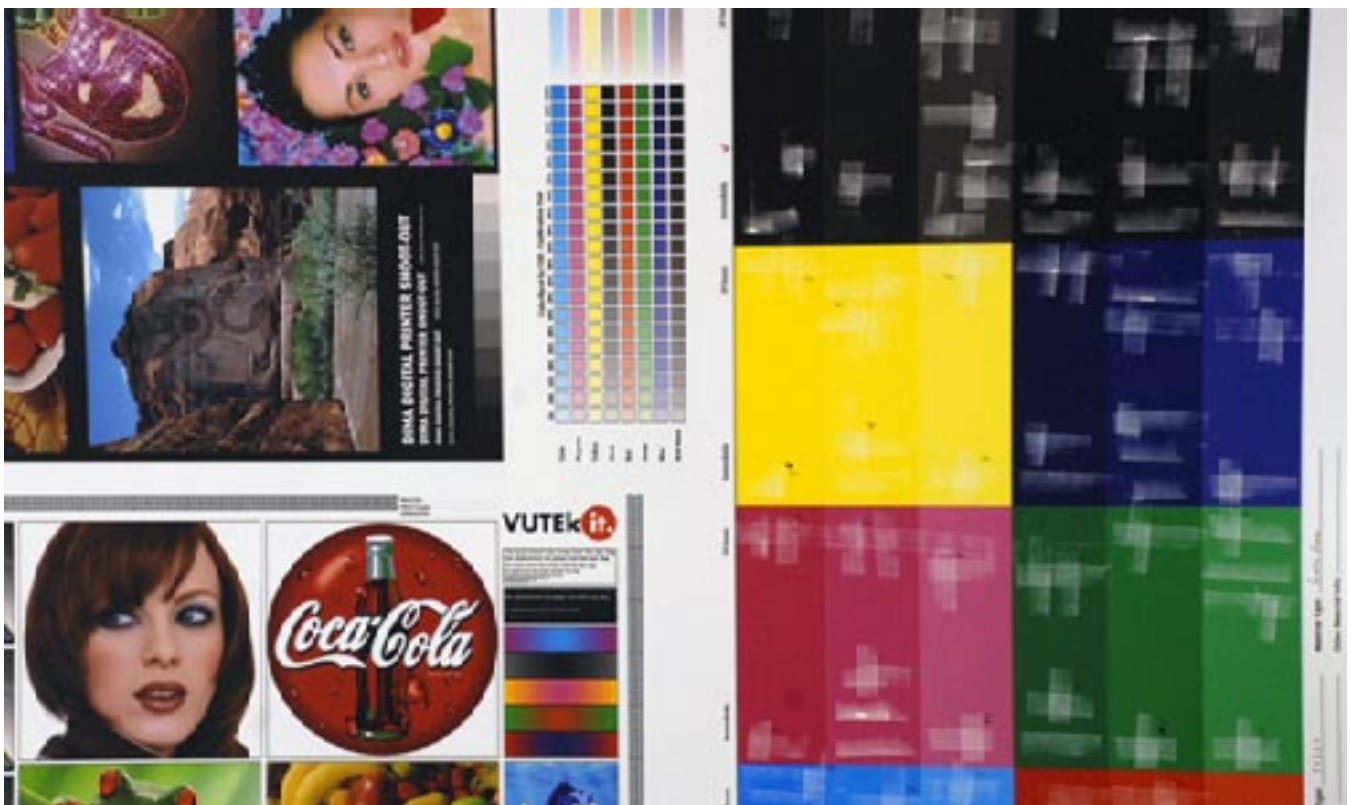- Polyester/Mylar
- Acrilic/Plexigrals
- Polypropylene

SUBSTRATES, Issues

180. What materials can this printer print on perfectly?

Plastics and vinyls: Sintra, styrene, Lexan, standard vinyl.

181. What materials can this printer print on sort of okay, but where you have to overcome problems?

Glass, needs primer first, heater later.

VUTEk QS UV adhesion test

VUTEk QS samples prints of FLAAR photographs from Guatemala

182. What materials can this printer not print on at all?
Very very thin material as sheets, such as 0.30 styrene. Such thin material should be fed as rolls. Material with varying thickness is not recommended either.

183. Can you print on mirrors?
Not advisable.

184. What exotic or atypical materials can you print on?
Stone, stone tiles, non-glazed tiles.

185. Heat concerns: will the heat generated by the UV curing lamps cause adverse effects to some delicate forms of heat-sensitive media? Which materials might curl, distort or dis color from the heat?
Heat sensitive materials would include polyethylene, polypropylene, shrink-wrap, very thin and thermal sensitive papers, plastic coated cartons, PVC and aluminum foil (www.dotprint.com/fgen/prod1297.htm).

Oce lists several other common signage materials as sensitive to the heat of UV lamps. For these reasons we have a separate FLAAR Report on applications and materials.

Heat can build up when the printhead carriage hovers over a small area to print a narrow job. Heat can build up inside the printer as materials (especially metal) absorb heat and hold it (and then radiate it out for a long time). So heat is not only an issue from the obvious and immediate heat of the UV lamps. Residual heat can be an issue as well.

VUTEk suggests "use common sense" after you realize the heat situation.

186. What about build up of static electricity? What kind of materials cause this? Do some materials generate static electricity which cause the media to attract ink in areas not suposed to be printed on. How is it manifested?

You do need to be aware of how to prevent static electricity build up:

- No carpets or rugs on the floor. Indeed you should consider anti-static tiles or carpet.
- Use a humidifier during winter months to avoid dryness
- Learn which media are susceptible to gathering a static charge.
- Consider a printer that has specific anti-static features:
  - Grounding
  - Static bar(s).

The VUTEk QS UV printer models have two anti-static bars, one on each side of the carriage.

187. What happens in very dry weather (low humidity), especially in winter with central heating?

During dry periods (with low humidity) static problems may increase. With a high static charge (such as with PVC materials), the ink is attracted to charged areas of the material. This results in overspray (ink laydown in unintended areas).

SUBSTRATES: Cleaning, Priming, Preparation

188. Do you have to brush off or otherwise clean each sheet of incoming material by hand before you print on it?

"Not as many issues with the current VUTEk ink used with this printer; these inks don't 'fisheye'."

189. Which substrates must be or ought to be prepared before printing by being corona treated?

Wipe with alcohol to remove static.
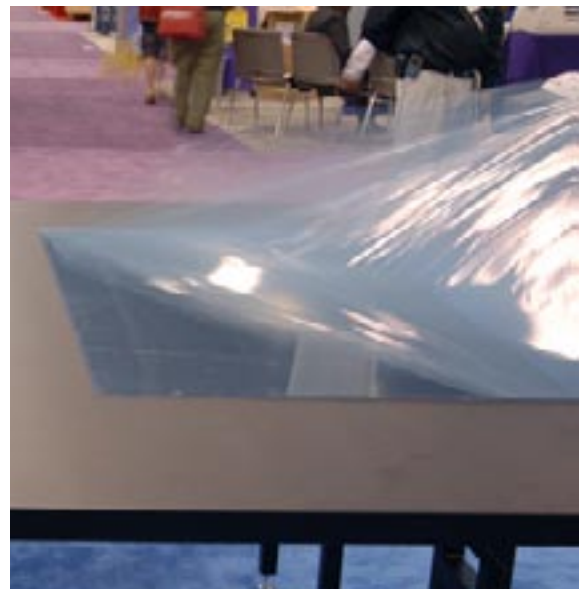
Samples at GoA 2007

190. Which substrates ought to be laminated, top-coated, or otherwise post-treated?

Realize that top-coating (a UV clearcoat) may be useful on some materials and even possibly required on some applications. This may require an additional machine, space, training, and further ventilation considerations. You are not protecting against the sun, you are protecting against the ink rubbing off slippery surfaces such as glass or marble.

Lamination can also serve to provide a glossy finish on a material that is naturally matte.

SUBSTRATES: General Concerns

191. Although this printer "prints on almost all materials," what is the adhesion rate with most materials? Does the ink easily scratch off certain materials?

VUTEk has undertaken their own adhesion tests, using an ASTM scratch test kit. So if you need specific facts, they do have them. As hardly unexpected, adhesion is weak on acrylics and glass, though depends on the brands sometimes.

192. What problems in feeding exist, such as skew to one side?

Skew will be something you have to be careful about with any printer that is not a dedicated flatbed. A dedicated flatbed is a printer where the media does not move; instead the media stays fixed to a vacuum table and the printhead (or the entire table) moves. But not all dedicated flatbeds can accept roll-to-roll materials.

Skew results because no one single feeding system can accommodate all kinds of surface characteristics, weight or thicknesses of materials.

193. What about edge-to-edge printing (borderless)?

Yes.

194. How much acclimatization time is needed for the substrates?

It does help if materials are at room temperature.

APPLICATIONS

195. Can you print fine art photos, giclee, or décor?

Yes.

196. Can you print on textiles or fabrics? How do you handle the ink that gets through the weave?

Yes.

197. What other kinds of applications can you print?

Suitability depends considerably on client expectations and experience. The newer software and newer printheads result in improved quality, though UV ink is still a tad grainy and may have banding. But if you can overcome these two issues, you can improve upon the comments below.

- Billboards (good on most materials, because viewing distance is far)
- Banners, general signage (good on most materials, because viewing distance is far)
- Exhibit graphics; okay if viewed up high or far away; somewhat grainy for close viewing
- Backlit; beautiful if viewed from a short distance away; may be too grainy and banded for close viewing. Be sure to first check and see if the software allows automatically using more ink with backlit materials (double strike) in order to achieve the needed higher ink density.
- POP; may be too grainy and banded for close viewing if client or customers are discerning or unaccustomed to output from UV-curable chemistry. But white layering makes UV printing a viable option.
- Bus shelters, okay if average viewer is not discerning.
- Rigid materials; logically UV-cured ink is a good choice for thick rigid materials.

A major application with potential for growth is wallpaper. I recently visited a printshop in Seoul, Korea, where they were using an IP&I Cube 260 and two IP&I Revo models to print wallpaper. VUTEk is addressing this market as well, though I have not yet had an opportunity to visit such a printshop. VUTEk mentions partners in Korographics, Dreamscapes, and Lintec.

Niche applications are very important when you own a UV printer. You can charge more for a unique application. With basic signage you are always competing for a commodity price; with architectural or interior decoration applications you can charge a premium price.

198. What kinds of applications are not something you should try? What applications print mediocre, or poorly, and why?

The biggest problem with UV-cured inks on vehicle graphics is when the material has to stretch or conform to the shape of the vehicle, especially over rivets, decorative trim, or anything that is not flat. Most UV printers are not recommended for vehicle wrap unless they use a special ink made to be flexible. Also be careful by making sure that adhesion and cleanser-resistance is adequate.

As newer flexible UV-cured inks become available, this situation will improve.

INK

199. Is there a special ink for flexible material, and another ink for rigid material? What other inksets are available? Is there any choice in inks?

Only one ink at present, but this is changing. 3M flexible ink will be available, and a UV Series 50 ink, special for glass, will be available.

200. Is an extrudable or thermal-formable ink available from the printer manufacturer?

At present only Mimaki and Gandinnovations offer a special heat-formable UV-cured ink. No comparable ink is yet available for a VUTEk UV printer.

201. How many colors are used to produce output - four, six, or eight?
Six colors plus white for a total of seven ink channels. This means you do not have to remove light cyan or light magenta to achieve white.

198. Other than white, how many spot colors are available? What about metallic colors?
No spot colors.

202. What is shelf life of the ink (CMYK)? Does the white ink have a shorter shelf life?
One year, including the white ink.

203. What company makes the inks? Choices include DuPont, Jetrion (Flint), Sericol, Sun, Triangle, KonicaMinolta, Tetenal and several others.
VUTEk bought Inkware several years ago. Inkware makes most of the ink for most VUTEk printers. EFI now owns VUTEk and hence owns Inkware. EFI recently purchased Jetrion from Flint Ink. Jetrion has tried for several years to enter the inkjet market and has been successful mainly in narrow format inkjet printing of labels. But Jetrion has experience in cationic chemistry, which is considered as a potential future replacement for the free radical chemistry used in UV inkjet printing today.

Ink containers at GoA 2007

204. Where are the printer's ink containers located? Front, back, or sides?
The main colors are in the lower left cabinet. The white ink is in it's own cabinet behind, accessible from the rear.

White Ink

INK: White & Varnish

205. Is white ink available?
Yes, white comes with all QS models.

206. To use white ink does that require not using light colors in order to make space for the white ink?
The QS printers are a dedicated 7-channel system, so white is built in. You do not have to sacrifice light Cyan or light Magenta in order to use white.

207. What is the sequence of printing the white ink? Can you print all white and then print colors on top?
White can be printed as
> • Spot white
> • Precoat white
> • Postcoat white

If your digital image files have been prepared by a professional who has specific knowledge with how to prepare a file to receive white, black, and colors in layers, the results can be impressive. I have seen the same quality on a NUR and Zund. The results of using white are as much in how the file is organized as the printer itself. Most sophisticated printers that offer white ink can do a capable job.

I would be skeptical of white ink that is offered with cheap Chinese printers. I would first want to see significant print samples during an actual test. Many Chinese printers list, indeed feature white ink and varnish. The fact they list varnish reveals how little they know about the reality. Varnish does not work adequately even on a Durst Rho; VUTEk does not even offer varnish precisely for these reasons. So please excuse me for being skeptical of white and varnish being offered for lesser printers.

208. How many ink lines or printheads are dedicated to white ink? One or two?
There is one ink line for white, and the same number of printheads as the regular colors.

209. Is the white ink opaque enough?
The samples of white ink that I saw looked attractive but realize that samples are done with a maximum number of passes precisely to make them look irresistible. In a real-life printshop, the time it takes to produce this level of quality may become a factor (this holds true for any brand of printer).

210. What is the shelf life?
12 months is the usual expected shelf life.

211. Does the white ink need special attention? (Titanium dioxide may settle out if it sits too long). What company provides the white ink?
White ink needs to be agitated periodically.

212. Is the white ink situated in the same area as the other inks?
The normal six ink colors are situated in the front lower left cabinet. The white ink is directly behind, accessed from the back door (it would be the back right).

213. Does the printer manufacturer supply tips on how the graphic designer should prefer a bit-mapped and a vector-based illustration to use white?
Yes, in an instruction manual on white ink VUTEk provides tips for how designers should prepare their files in Adobe Photoshop and other software.

214. Is spot varnish available?
Spot varnish is difficult to manage and one owner reported that not even on his sophisticated Durst Rho 600 does not always work as expected.

Also, VUTEk points out that many end-users mis-interpret varnish to mean lamination. But varnish is decorative, not protective. So for most users, spot varnish is not cost effective (even if it did work as promised). Thus VUTEk does not yet offer spot varnish.

215. Is an extrudable ink available?
No, presently only Gandinnovations and Mimaki offer a heat-formable UV ink. Hexion also offers this ink but Hexion is an ink company not a printer manufacturer.

INK Cost

216. Does ink come in cartridges or bulk? How large are the ink containers for replacement ink?
Ink comes in 3.25 liter "bag in a box" style container.

217. What is the cost per container? What is this cost translated to liters?
List price is $180 per liter.

218. Does the printer itself have a means to keep track of ink usage? Is this a guestimate, or an actual count of droplets fired?

Both, keeps track of bags too.

219. How many square units does 1 liter of ink print?

One liter of ink can potentially print up to 800 square feet of material. Naturally this varies by the image.

220. What is the ink usage compared with a solvent printer?

UV machines typically use less ink than a solvent printer. VUTEk estimates 20-30% less.

221. How much ink does the waste ink container hold?

5 gallons. That is approximately 20 liters. Ouch, when you consider the cost of ink per liter.

222. How much of this is ink, and how much is solvent flush?

Almost all of this is ink because with a VUTEk you do not normally run solvent flush through the machine.

223. How often does the waste container need to be emptied?

Should be checked daily. "In the demo room we empty the waste ink container weekly because we do a lot of start and stop printing, so we purge more often. If the printer has not been used for an hour, you need to purge before you start printing again.

224. How do you know when the waste container is full?

The system will alert you and will not allow you to do more purging.

225. How can you see the remaining ink level?

Each ink container hangs on a scale. How low the ink is shows on a monitor.

226. Can you hot swap the ink (refill with ink while the printer is running)?

Yes.

227. Can this printer use after-market ink? If yes, what are pros and cons? If no, why is no after-market ink available or widely utilized?

After-market UV ink is seldom used due to risk. Also, the VUTEk system is protected by chips.

228. What kind of protective devices are on the ink system to keep you from using after-market ink?

There is an RFID tag to make sure that ink is not expired.

229. Do you have to upgrade software every month or so to use ink to foil being able to use after-market ink?

No, not for ink use.

INK: General Knowledge

230. How much ink does the ink container in the printer hold?
Bag-in-a-box, 3.25 liters.

231. How is new ink added? Pouring into the on-board container? Switching the container to the new ink container?
You take the old box out (and throw it away) and connect the new box.

232. What is the situation with the ink gelling?
"No issues." This can be checked with a site-visit case study once more of these printers are out and around to see.

233. What filters are on the ink system to trap particles or trap gelled ink?
Two filters are on each ink line.

234. How is air removed from the ink delivery system and/or removed from the printhead?
Bleeders.

235. Is there an issue with "ink starvation?"
"No, feeding is from primary to secondary ink chambers."

"Ink starvation" means that not enough ink can get to the printheads in fast printing modes. Ink starvation is a real issue that affects even some quarter-million dollar printers. So you need to check with end-users to see if they have issues with ink starvation.

236. To what degree is the ink heated? Can you control the temperature?
180 degrees F. Yes, you can control the temperature if necessary.

237. Can the end-user vary the printhead temperature, or is the temperature fixed?
In reality, the end-user will not be encouraged to vary the printhead or ink temperature on their own.

238. How long does it take to heat the ink in the morning at startup?
2 or 3 minutes.

239. Has any misting or spray been reported? What about ink inside the machine parts?
"These heads are clear."

INK: Longevity

240. What is the longevity outdoors? What about in the full sun in direct sunlight?
Two years uncoated; 5 years if laminated.

241. What about solvents such as cleaning solvents? Do they mar, dull, or wash away the ink or change the surface quality, especially on vehicle wrap?
• Ammonia (in Windex and comparable cleaning liquids): not recommended.
• Gasoline is not recommended.
In any event, UV-cured ink is not recommended for vehicle wrap.

• Cleaning alcohol, "no problem"

The following test results are not yet available:
• Soap and water with sponge
• Soap and water with a broom (frequently used to clean vehicle wraps in Latin America, for example)
• Scotch-tape pull-off test
• Acetone ("more likely to eat the material than the ink, but have not tried")

INK Color Gamut

242. Which colors print best?
• Skin colors
• hair
• blue

243. What about silver or other metallics?
Metallic colors print very nicely, as typical of all kinds of UV-curable ink.

244. Which colors print poorly or not at all?
Reds typically print poorly with most UV inks. Reds tend to be too orange, too pink, or too magenta.

THE UV CURING LAMPS

245. How many different sets of lamps are there? Is there pinning first and then curing later?
One set of lamps, but even so, there is curing with each additional pass.

246. What technology is used in curing lamps: microwave, continuous (mercury arc), LED, or flash (pulsed Xenon)?
Mercury arc.

247. Are the lamps special in order to accommodate white ink?
No.

248. What is warm up time?
3 to 5 minutes.

249. How long can the lamps stay on before they automatically shut off?
These lamps don't get shut down as often as on other printers. They appear to stay on all the time in a low ready range, with the shutters closed.

250. What about shut-down sequence, shut-down time, and wait-time before restrike?
Still 3 to 5 minutes.

251. What brand of lamp is used?
Portions of the UV lamps are made by VUTEk. The model 180 used lamps from Dr Hönle; this is the brand still used by Gandinnovations and other high-end UV printers.

UV-curing lamps, GoA 2007

252. How many settings do the lamps have?
- Minimum (25%)
- Low (50%)
- Medium (75%)
- High (100%)

253. Can you have one lamp on one setting and the other lamp on another setting? Or do both lamps have to be on the identical setting?
This seems to be proprietary information.

254. What shuts the lamps off? For example, after so many minutes of not being used; or if they overheat?
Electronically controlled.

255. How long does the lamp last, in terms of hours of operation? How many hours are used up by each "strike" (by each time you turn the lamps on)?

1000 hours.

256. Is the lamp fan filter a user-replaceable item? How often should this be cleaned or replaced?

If the filter gets clogged with dust then it is less efficient in keeping down heat. Heat build-up is not good for the overall carriage area.

257. How do you keep track of lamp-hours?

There is a timer in the software.

258. What is the true drying (curing) time of the inks used with this set of lamps? What factors influence the true (total) drying time?

VUTEk answered this question honestly: "chain cross-linking does take 24 hours."

UV LAMPS: Cooling

259. Are there shutters?

Yes.

260. How often do the shutters stick?

On other brands shutters do or may stick, so be absolutely sure to visit a print shop that has the printer you are interested in, and ask specifically whether the shutters on their UV lamps stick. VUTEk suggests that their shutters "almost never" stick. VUTEk personnel tended to answer honestly, in part because sooner or later I will visit an end-user and find out anyway.

261. What shutter mode settings are there?

- Single cure (trailing lamp only)
- Post cure (leading lamp only)
- Double cure (both lamps)

262. How are the lamps cooled? Air? Fans? Water-cooled?

Air from fans. Water-cooled UV printers tend to be in the half-million dollar price range.

263. How many fans are there per lamp?

Two.

264. What other fans are there in the printer?

At the recent Shanghai show I was surprised at how many Chinese-made UV printers had no ventilation holes and few fans. Some brands were okay in this respect, but heat is the key problem with any UV printer and should be the first thing an engineer changes when trying to add UV lamps to a solvent printer (most first-generation Chinese printers are retrofitted from a solvent model).

QS fans

VUTEk has two 5" fans at the lower-mid right end and also two of the same size at lower-mid left end.

265. In the areas at left and right of the printing area, is the surface specially protected against the extreme heat of the UV lamps when they carriage is parked?

No, there is not any special material, such as tiles or even an open grill, for under where the lamps are when parked. There is also no heat protection or dissipation at the other end (where the UV lamps reach if printing a full-width pass. You can see heat protective/dissipation materials on these positions on the Gandinnovations Jeti and many other printers. They are spaced evenly to be directly under the lamps when the lamps are parked or "turning around" for the return pass.

UV LAMPS: Reflectors

266. Do lamps have dichroic reflectors?
Yes.

267. Do the lamps have water-based cooling?
No, you get water-based cooling primarily on L&P and other half-million dollar systems.

268. How often do you need to replace the reflectors? What does this cost?
"So far never had to replace a reflector."

RIP SOFTWARE & Printer Software

269. Does the price of the printer include a RIP? If a RIP is included or part of a package, is it a lite RIP or a full-featured RIP? Can this RIP be updated? Can it run any other printers?

EFI makes its own RIP, "Fiery" XF. EFI also offers Colorburst as an alternative RIP. Colorburst was the primary RIP for VUTEk printers the last ten years (prior to EFI buying VUTEk).

There are several advantages to EFI's new RIP software. First, it comes from the manufacturer itself, so would be expected to be more tightly integrated. Second, EFI offers an entire business management software. Not many other printer manufacturers offer such an all-inclusive package. Probably due to the sophistication of this software it is not an easy thing to evaluate.

Software is Linux based.

470. Is your printer and/or RIP Pantone certified?
Yes.

COLOR MANAGEMENT FEATURES

271. What color management sensors or measuring tools are on-board?
It would not be expected that most printers have any of their own color management tools built into the printer. The ColorSpan 72UVR, 72UVX and 9840uv are the only UV-cured ink flatbed printers that we know of that offers color management features actually built inside the printer.

But most people are accustomed to using a regular spectrophotometer and Monaco ICC color profiling software to achieve custom profiles. The EFI and ColorBurst RIP options will coordinate with color management software to offer a professional solution.

PRODUCTIVITY & ROI (Return on Investment)

272. How much time does it take to set-up each new size and shape of rigid printing substrate?
This aspect is not listed in any spec sheet. You learn this only if you spend an entire day in the demo room, but doing the loading and printhead height calibration yourself. Then you get a further comparable reality check when you start production in your own print shop.

This factor will make or break your production goals. It makes little difference how fast a printer will print if you have to spend 7 frenzied minutes to align and set-up each new print job by hand.

So find one of these printers that is already installed, and learn from them what productivity obstacles exist and what real throughput is.

273. Can this printer hold up to two or three shifts per day all week?
Yes, this printer is "made to run."

274. Does this printer have to be turned off to rest between shifts?
It is not so much that you need to turn it off, but you do need to oil the rails every 8 hours and accomplish other needed maintenance between shifts.

ADVERTISING CLAIMS:

275. How does the actual printer compare with what was claimed in the ads?
Because the printer is new, it takes a while to learn how it functions in the real world compared with the ad claims.

Virtually all printers, of almost every brand, emphasize their max dpi and their max speed. They rarely warn the end-user that the top dpi is usually at a slower speed and the maximum speed tends to be unusable output (usually with banding). In other words, you don't usually get the advertised speed with the advertised dpi. It is one, or the other. The sophisticated and experienced print shop owner normally recognizes this twist of fate in advance.

The way to learn the actual speed at which you produce attractive output is to clock what you see at a trade show and then to visit a print shop with the machine in action. With the new generation of printheads and improved software algorithms, a usable quality at an acceptable speed is improving with each new model of printer.

477. Do certain parts of the printer need to be repaired or accessed so often that you have to remove safety plates or protective plates to make access easier?
This is mainly with Chinese-made printers.

278. How often do people return this printer and say they want their money back?
This would be an excellent question, albeit tough to get an answer.

GENERAL CONSIDERATIONS

279. How many printers of this model are in use; in the USA; in the rest of the world? Not how many are in dealer showrooms, not how many are in beta test sites or are considered to have been "sold" on paper, but how many are functioning and producing output in commercial establishments.
Sales figures vary greatly in veracity. Kodak claimed to have sold their entire production run of their 5260 printer, when in fact the printer did not function. Literally, it did not work for more than several hours even with Kodak tech support in the trade show booth. Yet Kodak repeatedly claimed they had sold all their printers.

Several UV-curable printer manufacturers have given me inflated figures of "sales" which were really just a wish list of hot prospects that had expressed interest by visiting their booth.

If 18 VUTEk UV printers were sold at SGIA '06, this is indeed possible. Print shop owners do wait for trade shows to place their orders, and thus manufacturers group their sales records to coincide with such a trade show.

During 2006 VUTEk probably sold at least 200 UV printers, though it may have been more. VUTEk solvent printers are also selling well too (more than 200 a year). These sales estimates are why VUTEk, Inca, Gandinnovations, Durst, and MacDermid ColorSpan are doing so well. Even GRAPO has sold more than 200 of their Octopus UV printer (since it was introduced; not just in 2006). The companies which are not experiencing these rates are Neolt, Agfa, DuPont, NUR, HP Scitex, Oce, etc. However for 2007, Oce's sales rates will soar on the success of their model 250 GT.

COMPARISONS WITH OTHER PRINTERS

280. When people are considering buying this printer, what other printer(s) are they also looking at?
The Durst Rho 600 and newer Rho 600 Pictor are competing printers.

End-users considering the VUTEk would also be looking at the Gandinnovations flatbed and roll-to-roll printers.

Some print shops would be looking at the lower price of the DuPont Cromaprint, but the track record of this printer since it was introduced in 2004 has been complicated by frequent needs to redesign features that did not work well (at least they do the redesign, and DuPont installs the retrofits at no cost). So every few months this printer is better than it was before. But a professional printshop expects that for a quarter million dollars the printer is finished and works well from Day One. If a printshop is a beta tester they should get a substantial discount, and especially, they should be notified that they are a beta tester to assist in improving everything that does not yet function. If they are not a beta tester, then there should be no reason to change or improve anything on the printer. So it can't be both ways; either a printer is finished, or not.

The ColorSpan 9840uv is a potential contender due to its substantially lower price point. This printer has gone through several firmware upgrades in the last six months.

In Europe people would look at the GRAPO Octopus: over 200 of these have been sold in Europe alone. Although this is a combo printer and capable of printing on rigid materials, it was made primarily for printing roll-fed material. Indeed one version is roll-fed only. Remember, transport belts do their best to be multi-purpose, but most transport belt systems have issues. This is what end-users report, for most brands.

The Dilli and Agfa UV printers might appeal to some print shops but these brands are not yet well established.

IP&I is an increasing capable competitor. Information is increasingly available on their models especially now that FLAAR has spent three days in Korea inspecting this printer inside out. In the process we discovered it has some unusual features that set it apart in terms of engineering quality. This printer is so much better than anything yet available in China that this blunt fact needs to be stated clearly. Its printers are impressive and they were selling well at Sign Spain (Madrid 2006). FLAAR reports sales records for most major UV printer manufacturers in its FLAAR Reports.

The Inca Turbo or Inca Spyder are other printers that a print shop owner might consider. Perhaps Lüscher as well, as long as a print shop can consider this price range. We have interviewed the two different owners of Lüscher JetPrint machines (one in Europe; one in the USA). However Luscher has not shown their UV printers at the last two major international venues, which suggests either the printer or the company have issues. We strong advise anyone considering a Luscher to get their hands on both FLAAR reports that report what end-users say.

The new OCE Arizona 250 GT attracted crowds at SGIA, but it prints very slowly. It boosts of doing 4-pt type well but the IP&I also does small fonts accurately, and Gandinnovations has new algorithms for improving text even with a Spectra printhead. Main weaknesses of the Oce Arizona 250 are lack of six colors (it's CMYK only), lack of white, no ability to print on roll-fed material (this feature clearly has issues, or otherwise it would have been shown at ISA '07 and FESPA '07. So merely being able to render 4 pt type is no longer enough, since I saw the IP&I in Korea do small type flawlessly during test printing while I was in the factory. Frankly, the quality I have seen with white ink from VUTEk, NUR, IP&I, and the Zund 250, if I were a large printshop, I would want white ink for sure.

But the advantage of the Oce is that it has no transport belt, so there is no skew whatsoever.

With all these competing options there is a growing market for independent comparisons and assessments such as provided by the work of FLAAR.

SUMMARY: Image Quality Issues: Banding

281. Can you vary the material feed rate?
Yes, you need to improve the media feeding if you get banding.

SUMMARY: Image Quality Issues: General

282. Is text sharp or fuzzy? What is the smallest text that you can easily read?

VUTEk has continued to improve their smoothing algorithms for reducing splatter. A smaller picoliter drop size helps too. You need to check to see to what degree the printer is slowed down in order to improve the text definition. But judging from the text samples I have seen, the output at 8 pt and 12 pt is quite nice and even down to 4 pt it looks usable. If you compare with output from a Chinese UV-curable inkjet printer you quickly see how bad the text is from Xaar heads or even from Spectra heads when in a Chinese machine. It will be interesting to see what text looks like from a low-end Flora printer that uses Toshiba Tec printheads.

283. Can the system produce glossy finish? To what degree is surface glossiness an issue? Can you select glossy or matte or do you get what the system provides and that is all? If you get only one, or the other, which is it you get?

Gloss depends on the inherent gloss (or lack thereof) of the substrate. Or, you can coat the material. In other words, as with about half the UV inkjet printers, there is no special mechanism for achieving a glossy surface.

284. Do you need "Pantone markers" to do touch-ups?

If you use Pantone markers or other markers for touch-ups you run the risk that these areas will fade faster than the original UV ink.

Conclusions

Pros

New and improved printheads from Seiko, Konica Minolta, Toshiba Tec and others are providing features that are comparable or better to Spectra heads (the former industry standard for industrial class inkjet printers). Not many high-end UV printers use Xaar printheads any more.

Multi-layering capabilities with white ink means you can achieve POP signage for airports, cosmetics boutiques, and upscale clothing stores that rival output from LightJet and Lambda.

End-user assistance from VUTEk is becoming available to help graphic designers prepare images that can take advantage of multi-layering that includes white ink.

I like the overlapping flaps on the skirt that protects the user from UV light that could damage his retinas. The Oce 250 is totally lacking a cover, is totally lacking a skirt, and thus has serious potential for retinal damage.

The VUTEk QS printers are not complicated. Everything, such as roll-fed media system, is relatively simple. The advantage is ease of use, ease of training, and less things to fall apart.

Downsides

All printers, even ones that we like, have downsides and issues.

The best place to obtain a list of downsides is to visit a printshop that has the printer, and ask both the owner and also separately the printer operator, what are the pros and cons.

We will initiate a site-visit case study as soon as we find one of these printers in a city nearby or a city where we are undertaking other research. But until we can prepare the list of end-user critique, the one aspect that we feel should be brought up is as follows.

This model inherits the same transport belt as the earlier model 200/600. End-users report skew with some materials on that earlier model. Although skew can also result from poor loading of the material to begin with, end-users naturally assume that a printer in the quarter-million dollar price range will handle all standard signage materials acceptably.

Transport belts are the weakest part of 80% of the combo style printers that we have inspected. The best way to check on the reliability of the transport belt is to ask several end-users; ask the printer operator, not the owner or manager. If they report no skew on the VUTEk QS system whatsoever, then the transport belt is no longer an issue.

Unique Features

To operate the VUTEk requires a security password that is in synch with your payment schedule. In other words, if you have not made your monthly payment, the printer does not turn on.

Comments

The roll-feeding system is the most simple of any mid-range to high-end combo style printer: one single roll fees the material; one single roll takes it up at the other side. No dancer bars, no tension bars. This keeps the price down and makes loading easier. Whether a simple system feeds the materials better than the complex roll-fed systems of competing brands will require considerable research and inspection of many print shops. So it is premature to list the VUTEk roll-feeding system as a positive or as a neutral feature.

Few UV printers offer perfect color: most UV reds are too orange. The Mimaki JF-1631 and a new ink for the Gandinnovations Jeti flatbed are the only two I would call near perfect. But the VUTEk did an outstanding job rendering the diverse hues in three species of heliconia flower from the FLAAR Photo Archive. These shots were taken with a 33 megapixel Phase One (camera provided courtesy of Global Imaging). The VUTEk rendered their quality perfectly. Frankly I was pleasantly surprised.

When I visited the factory and demo room, VUTEk had no hesitation to leave me alone to inspect the printer. Inside the factory they had no restrictions on what I was allowed to photograph (though inside any factory I use common sense self-restrictions on what I photograph). The VUTEk staff answered questions honestly and did not attempt to smother the discussion in smoke-and-mirrors. Clearly the VUTEk personnel are proud of their printer and thus were open to showing FLAAR all its features in a manner that did not try to hide anything.

Suggestions

Substantially updated July 2007 after visiting the VUTEk factory and demo room.

First issued 2006. Previously updated January 2007 and May 2007.

Legal notice

Inclusion in this study by itself in no way endorses any printer, media, ink, RIP or other digital imaging hardware or software. Equally, exclusion from this study in no way is intended to discredit any printer.

Advisory

We do our best to obtain information which we consider reliable. But with hundreds of makes and models of printers, and sometimes when information about them is sparse, or conflicting, we can only work with what we have available. Thus you should be sure to rely also on your own research, especially asking around. Find another trustworthy end user of the same make and model you need to know about. Do not make a decision solely on the basis of a FLAAR report because your situation may be totally different than ours. Or we may not have known about, and hence not written about, one aspect or another which is crucial before you reach your decision.

The sources and resources we may list are those we happen to have read. There may be other web pages or resources that we missed. For those pages we do list, we have no realistic way to verify the veracity of all their content. Use your own common sense plus a grain of salt for those pages which are really just PR releases or outright ads.

We are quite content with the majority of the specific printers, RIPs, media, and inks we have in the FLAAR facilities. We would obviously never ask for hardware, software, or consumables that we knew in advance would not be good. However even for us, a product which looks good at a trade show, sounds good in the ad literature, and works fine for the first few weeks, may subsequently turn out to be a lemon.

Or the product may indeed have a glitch but one that is so benign for us, or maybe we have long ago gotten used to it and have a workaround. And not all glitches manifest themselves in all situations, so our evaluator may not have been sufficiently affected that he or she made an issue of any particular situation. Yet such a glitch that we don't emphasize may turn out to be adverse for your different or special application needs.

Equally often, what at first might be blamed on a bad product, usually turns out to be a need of more operator experience and training. More often than not, after learning more about the product it becomes possible to produce what it was intended to produce. For this reason it is crucial for the FLAAR team and their university colleagues to interact with the manufacturer's training center and technicians, so we know more about a hardware or software. Our evaluations go through a process of acquiring documentation from a wide range of courses and these naturally include the manufacturer itself. Obviously we take their viewpoints with a grain of salt but often we learn tips that are worthy of being passed along.

Even when we like a product and recommend it, we still can't guarantee or certify any make or model nor its profitability in use because we don't know the conditions under which a printer system might be utilized in someone else's facility. As a result, products are described "as is" and without warranties as to performance or merchantability, or of fitness for a particular purpose. Any such statements in our reports or on our web sites or in discussions do not constitute warranties and shall not be relied on by the buyer in deciding whether to purchase and/or use products we discuss because of the diversity of conditions, materials and/or equipment under which these products may be used. Thus please recognize that no warranty of fitness or profitability for a particular purpose is offered.

The user is advised to test products thoroughly before relying on them. We do not have any special means of analyzing chemical contents or flammability of inks, media, or laminates, nor how these need to be controlled by local laws in your community. There may well be hazardous chemicals, or outgassing that we are not aware of. Be aware that some inks have severe health hazards associated with them. Some are hazardous to breathe; others are hazardous if you get them on your skin. For example, some chemicals such as cyclohexanone do not sound like chemicals you want to breathe every day. Be sure to obtain, read, and understand the MSDS sheets for the inks, media, and laminates that you intend to use. Both solvent, eco-solvent, and UV-curable inks are substances whose full range of health and environmental hazards are not yet fully revealed. It is essential you use common sense and in general be realistic about the hazards involved, especially those which are not listed or which have not yet been described. FLAAR is not able to list all hazards since we are not necessarily aware of the chemical components of the products we discuss. Our reports are on usability, not on health hazards.

Most inks are clearly not intended to be consumed. Obviously these tend to be solvent inks and UV-curable inks. Yet other inks are edible, seriously, they are printed on birthday cakes. Indeed Sensient is a leader in a new era of edible inks. Therefore the user must assume the entire risk of ascertaining information on the chemical contents and flammability regulations relative to inks, media or laminates as well as using any described hardware, software, accessory, service, technique or products.

We have no idea of your client's expectations. What students on our campus will accept may not be the same as your Fortune 500 clients. In many cases we have not ourselves used the products but are basing our discussion on having seen them at a trade show, during visiting a print shop, or having been informed about a product via e-mail or other communication.

Be aware that trade show results may not be realistic. Trade shows are idealized situations, with full-time tech support to keep things running. The images at a trade show may be tweaked. Trade show examples are on the absolutely best media. When you attempt to save money and use economy media you will quickly notice that you do not get anywhere near the same results as you saw in the manufacturer's trade show booth, or pictured in their glossy advertisement. Four years ago we noticed Epson was laminating prints to show glossy output because their pigmented inks could not print on actual glossy media. The same equipment, inks, media, and software may not work as well in your facility as we, or you, see it at a trade show. All the more reason to test before you buy; and keep testing before you make your final payment. Your ultimate protection is to use a gold American Express credit card so you can have leverage when you ask for your money back if the product fails.

You absolutely need to do print samples with your own images and the kind provided by your clients. Do not rely on the stock photos provided by the printer, ink, media, or RIP manufacturer or reseller. They may be using special images which they know in advance will look fabulous on their printer. Equally well, if you send your sample images to the dealer, don't be surprised if they come back looking awful. That is because many dealers won't make a serious effort to tweak their machine for your kind of image. They may use fast speed just to get the job done (this will result in low quality). Check with other people in your area, or in the same kind

of print business that you do. Don't rely on references from the reseller or manufacturer (you will get their pet locations which may be unrealistically gushy): find someone on your own.

Factors influencing output Heat, humidity, dust, experience level of your workers (whether they are new or have prior years experience): these are all factors that will differ in your place of business as compared with our two universities.

Actually you may have people with even more experience than we do, since we deliberately use students to approximate newbies. FLAAR is devoted to assisting newcomers learn about digital imaging hardware and software. This is why Nicholas Hellmuth is considered the "Johnny Appleseed" of wide format inkjet printers.

Therefore this report does not warranty any product for any quality, performance or fitness for any specific task, since we do not know the situation in which you intend to use the hardware or software. Nor is there any warranty or guarantee that the output of these products will produce salable goods, since we do not know what kind of ink or media you intend to use, nor the needs of your clients. A further reason that no one can realistically speak for all aspects of any one hardware or software is that each of these products may require additional hardware or software to reach its full potential.

For example, you will most likely need a color management system which implies color measurement tools and software. To handle ICC color profiles, you may need ICC color profile generation software and a spectrophotometer since often the stock pre-packaged ICC color profiles which come with the ink, media, printers and/or RIPs may not work in your situation. Not all RIPs handle color management equally, or may work better for some printer-ink-media combinations than for others.

Be aware that some RIPs can only accept ICC color profiles: you quickly find out the hard way that you can't tweak these profiles nor generate new ones. So be sure to get a RIP which can handle all aspects of color management. Many RIPs come in different levels. You may buy one level and be disappointed that the RIP won't do everything. That's because those features you may be lacking are available only in the next level higher of that RIP, often at considerable extra cost. Same thing in the progression of Chevy through Pontiac to Cadillac, or the new Suburbans. A Chevy Suburban simply does not have all the bells and whistles of the Cadillac Escalade version of this SUV.

Don't blame us... besides, that's why we are warning you. This is why we have a Survey Form, so we can learn when you find products that are inadequate. We let the manufacturers know when end users complain about their products so that the manufacturers can resolve the situation when they next redesign the system.

Most newer printer models tend to overcome deficiencies of earlier models. It is possible that our comparative comments point out a glitch in a particular printer that has been taken care of through an improvement in firmware or even an entirely new printer model. So if we point out a deficiency in a particular printer brand, the model you may buy may not exhibit this headache, or your kind of printing may not trigger the problem. Or you may find a work-around.

Just remember that every machine has quirks, even the ones we like. It is possible that the particular kind of images, resolution, inks, media, or other factors in your facility are sufficiently different than in ours that a printer which works just fine for us may be totally unsatisfactory for you and your clients. However it may be that the specific kind of printing you need to do may never occasion that shortcoming. Or, it may be that your printer was manufactured on a Monday and has defects that are atypical, show up more in the kind of media you use which we may not use as often or at all during our evaluations. Equally possibly a printer that was a disaster for someone else may work flawlessly for you and be a real money maker for your company.

In some cases a product may work better on a Macintosh than on a PC. RIP software may function well with one operating system yet have bugs and crash on the same platform but with a different operating system. Thus be sure to test a printer under your own specific work conditions before you buy.

And if a printer, RIP, media, or ink does not function, return it with no ands, ifs or buts. Your best defense is to show an advertising claim that the printer simply can't achieve. Such advertising claims are in violation of federal regulations, and the printer companies know they are liable for misleading the public. But before you make a federal case, just be sure that it is not user error or unfamiliarity. It may be that training or an additional accessory can make the printer do what you need it to accomplish. Of course if the printer ads did not warn you that you had to purchase the additional pricey accessory, that is a whole other issue. Our reviews do not cover accessories since they are endless, as is the range of training, or lack thereof, among users.

Also realize that the surface of inkjet prints are fragile and generally require lamination to survive much usage. Lamination comes in many kinds, and it is worth finding a reliable lamination company and receiving training on their products.

Although we have found several makes and models to work very well in our facilities, how well they work in your facilities may also depend on your local dealer. Some dealers are excellent; others just sell you a box and can't provide much service after the sale. Indeed some low-bid internet sales sources may have no technical backup whatsoever. If you pay low-bid price, you can't realistically expect special maintenance services or tech support later on from any other dealer (they will tell you to return to where you paid for the product). This is why we make an effort to find out which dealers are recommendable. Obviously there are many other dealers who are also good, but we do not always know them. To protect yourself further, always pay with a level of credit card which allows you to refuse payment if you have end up with a lemon. A Gold American Express card allows you to refuse payment even months after the sale. This card may also extend your warranty agreement in some cases (check first).

Most of the readers of the FLAAR Reports look to see what printers we use in our own facilities. Readers realize that we will have selected the printers that we like based on years of experience and research. Indeed we have met people at trade shows who told us they use the FLAAR web site reports as the shopping list for their corporate purchases.

Yes, it is rather self-evident that we would never ask a manufacturer to send a product which we knew in advance from our studies was no good. But there are a few other printers which are great but we simply do not have them in our facilities yet. For example there are three Mimaki printers we would love to have (their 8-color JV22, their newest textile printer, their new UV-curable ink printer).

Now that Symphonic inks offers a special version of a Roland, combined with Evolution RIP, offers a 12 color version of Epson's 10000 printhead generation which offers 32 passes, wider than Epson's 44 inch limit and less banding than previous Roland models, that would be the ultimate fine art giclee printing factory. But since that printer is not available to our university, and as these inks are not easily obtained, the art students on our campus use our HP DesignJet 5000ps, HP 5500ps, HP 130, Epson 4800, Epson 7600, and Epson 7800. The art department does museum exhibits and wins awards with the output. We are also looking at the newer 12-channel Canon iPF and HP Z-series printers.

So if a printer is not made available by its manufacturer, then there is no way we can afford to have all these makes and models in our facility. Thus to learn about models which we do not feature, be sure to ask around in other print shops, with IT people in other corporations, at your local university or community college. Go to trade shows....but don't use only the booth...ask questions of people in the elevator, in line at the restaurant, anywhere to escape the smothering hype you get in the booth.

Taking into consideration we do not know the conditions in which you may be using your hardware, software, or consumables, neither the author nor FLAAR nor either university is liable for liability, loss or damage caused either directly or indirectly by the suggestions in this report nor by hardware, software, or techniques described herein because.

Acknowledgements

The FLAAR web sites began initially as the report on the results of these studies of scanners. Once we had the digital images we began to experiment with digital printers. People began to comment that our reports were unique and very helpful. So by 1999 we had entire sections on large format printers.

FLAAR has existed since 1969, long before inkjet printers existed. Indeed we were writing about digital imaging before HP even had a color inkjet system available. In 2000 FLAAR received an educational grant from Hewlett-Packard large format division, Barcelona, Spain, for training, for equipment, and to improve the design and navigation on the main web sites of the FLAAR Network. This grant ran its natural course, and like all grants, reached its finishing point, in this case late 2005.

In some cases the sponsorship process begins when we hear end-users talking about a product they have found to be better than other brands. We keep our ears open, and when we spot an especially good product, this is the company we seek sponsorship from. It would not be wise of us to seek sponsorship from a company with a sub-standard or otherwise potentially defective printer. So we usually know which printers are considered by end-users to be among the better brands before we seek sponsorship. After all, out of the by now one million readers, we have heard plenty about every single printer out there.

We thank MacDermid ColorSpan, Hewlett-Packard, Parrot Digigraphic, Color DNA, Canon, Gandinnovations and other companies for providing funding for technology training for the FLAAR staff and our colleagues at Bowling Green State University and for funds to allow us to attend all major international trade shows, which are ideal locations for us to gather information. We thank Drytac, Mutoh Europe, IP&I, Zund and VUTEk for providing funds so that we can make more of our publications free to end-users. During 2000-2001 we had grants to cover all the costs of our publications, and all FLAAR Reports were free in those early years. As the grant naturally expired after a few years, we had to begin charging for some of our reports to cover costs. Currently our reports on lamination tips are sponsored by Drytac and our publications on eco-solvent ink printers are sponsored by Mutoh Europe. Now (in 2007), we are seeking corporate sponsorship so we can gradually return to making at least 20% of our publications free to our readers.

It has been helpful when companies make it possible for us to fly to their headquarters so we can inspect their manufacturing facilities, demo rooms, and especially when the companies make their research, engineering and ink chemistry staff available for discussions. When I received my education at Harvard I was taught to have a desire to learn new things. This has guided my entire life and is what led me into wide-format digital imaging technology: it is constantly getting better and there is a lot to learn every month. Thus I actively seek access to improving my understanding of wide format printer technology so that we can better provide information to the approximately quarter-million+ readers of our solvent and UV printer web site (www.large-format-printers.org) and the over 350,000+ who read either our wide-format-printers.org site or our roughly half million combined who read our digital-photography.org and www.FineArtGicleePrinters.org sites.

ColorSpan, Gandinnovations, Grapo, IP&I, Mutoh, NUR, VUTEk, Zund have each brought FLAAR staff to their headquarters and factories. FLAAR has been guest at three Chinese wide-format printer manufacturing plants: Teckwin, MyJet, and one of the factories for Infiniti and Challenger. We have visited the world headquarters and demo rooms of HP in Barcelona and received informative and helpful technology briefings. We are under NDA as to the subjects discussed but it is important that we be open where we have visited. Mimaki Europe has had FLAAR as their guest in Europe to introduce their flatbed UV printer, as have other UV-curable manufacturers, again, under NDA as to the details since often we are present at meetings where unreleased products are discussed. But in general, you don't get this from a trade magazine, and I can assure you, we are provided much more detailed information and documentation in our visits than would be provided to a magazine author or editor. Companies have learned that it's a lot better to let us know up front and in advance the issues and glitches with their printers, since they now know we will find out sooner or later on our own. They actually tell us they realize we will find out on our own anyway.

We really liked some of the results whereas some of the other products were a bit disappointing. Providing samples does not influence the evaluations because the evaluators are students, professors, and staff of Bowling Green State University. These personnel are not hired by any inkjet printer company; they are universities employees (as is also true for Nicholas Hellmuth). The testing person for the HP ColorPro (desktop printer) said he frankly preferred his Epson printer. When we saw the rest results we did not include this Hewlett-Packard ColorPro printer on our list of recommended printers, but we love our HP DesignJet 5000ps so much we now have two of them, one at each university.

Sometimes we hear horror stories about a printer. The only way we can tell whether this is the fault of the printer design, or lack of training of the operator, is to have the printer ourselves in-house. Of course some printer manufacturers don't understand the reasons we need to have each make and model; they are used to loaning their demo units for a week or so. That is obviously inadequate for a serious review.

Some of the media provided to us failed miserably. Three printers failed to meet common sense usability and printability standards as well (HP 1055, one older desktop model (HP Color Pro GA), and one Epson). Yet we know other users who had better results; maybe ours came down the assembly line on a Monday or Friday afternoon, when workers were not attentive. One costly color management software package was judged "incapable" by two reviewers (one from the university; second was an outside user who had made the mistake of buying this package).

So it's obvious that providing products or even a grant is no shield from having your products fail a FLAAR evaluation. The reason is clear: the end user is our judge. The entire FLAAR service program is to assist the people who need to use digital imaging hardware and software. If a product functions we find out and promulgate the good news. If a product is a failure, or more likely, needs some improvement in the next generation,

we let people know. If a product is hyped by what an informed user would recognize as potentially false and misleading nonsense, then we point out the pathetic discrepancies very clearly.

This is what you should expect from an institute which is headed by a professor.

Actually, most of our reviews are based on comments by end users. We use their tips to check out pros and cons of virtually every product we discuss. You can't fool a print shop owner whose printer simply fails to function as advertised. And equally, a sign shop owner who earns a million dollars a year from a single printer brand makes an impact on us as well. We have multiple owners of ColorSpan printers tell us that this printer is their real money earner for example. We know other print shops where their primarily income is from Encad printers. Kinkos has settled on the HP 5000 as its main money maker production machine, and so on.

Yet we have documentation of several print shop companies whose business was ruined by specific brands that failed repeatedly. It is noteworthy that it is always the same brand or printer at both locations: one due to banding and printheads then simply no longer printing one color; the other brand due to pokiness of the printer simply not being competitively fast enough. Same with RIPs, we have consistent statements of people using one RIP, and only realizing how weak it was when they tried another brand which they found substantially better. Thus we note that companies which experiment with more than one brand of product tend to realize more quickly which brand is best. This is where FLAAR is in an ideal situation: we have nine RIPs and 25 printers. Hence it is logical that we have figured out which are best for our situation.

Grant funding, sponsorship, demonstration equipment, and training are supplied from all sides of the spectrum of printer equipment and software engineering companies. Thus, there is no incentive to favor one faction over another. We receive support from three manufacturers of thermal printheads (Canon, ColorSpan and HP) and also have multiple printers from two manufacturers of piezo printers (Epson and Mimaki). This is because piezo has definite advantage for some applications; thermal printheads have advantages in different applications. Our reviews have universal appeal precisely because we feature all competing printhead technologies. Every printer, RIPs, inks, or media we have reviewed have good points in addition to weaknesses. Both X-Rite and competitor GretagMacbeth provided spectrophotometers. Again, when all sides assist this program there is no incentive to favor one by trashing the other. Printer manufacturer ad campaigns are their own worst enemy. If a printer did not make false and misleading claims, then we would have nothing to fill our reviews with refuting the utter nonsense that is foisted on the buying public.

It is not our fault if some printers are more user friendly, print on more media than other brands. It is not our fault that the competing printers are ink guzzlers, are slow beyond belief, and tend to band or drop out colors all together. We don't need to be paid by the printer companies whose products work so nicely in both our universities on a daily basis. The printers which failed did so in front of our own eyes and in the print shops of people we check with. And actually we do try to find some redeeming feature in the slow, ink gulping brands: they do have a better dithering pattern; they can take thick media that absolutely won't feed through an HP. So we do work hard at finding the beneficial features even of printers are otherwise get the most critique from our readers. Over one million people will read the FLAAR Information Network in the next 12 months; 480,000 people will be exposed to our reports on wide format printers from combined total of our three sites on these themes. You can be assured that we hear plenty of comments from our readers about which printers function, and which printers fail to achieve what their advertising hype so loudly claims.

We turn down offers of funding every year. These offers come from PO Box enterprises or products with no clearly visible point of manufacture. Usually the company making the offer presumes they can buy advertising space just by paying money. But that is not what our readers want, so we politely do not accept such offers of money.

Contributions, grants, sponsorships, and funding for surveys, studies and research is, however, open to a company who has an accepted standing in the industry. It is helpful if the company has a visible presence at leading trade shows and can provide references from both end users and from within the industry. Where possible we prefer to visit the company in person or at least check them out at a trade show. Obviously the product needs to have a proven track record too. Competing companies are equally encouraged to support the FLAAR system. We feel that readers deserve to have access to competing information. Competition is the cornerstone of American individualism and technological advancement.

FLAAR also covers its costs of maintaining the immense system of 8 web sites in three languages and its university facilities in part by serving as a consultant such as assisting inkjet manufacturers learn more about the pros and cons of their own printers as well as how to improve their next generation of printers. It is especially useful to all concerned when manufacturers learn of trends (what applications are popular and for what reasons). For example, manufacturers need to know whether to continue designing software for Mac users, or concentrate software for PC users. So the survey form that you fill out is helpful to gather statistics. You benefit from this in two ways: first, you get the FLAAR reports in exchange for your survey form. Second, your comments bring (hopefully) change and improvement in the next generation of printers. When we do survey statistics, then the names, addresses, and telephone numbers are removed completely. A survey wants only aggregate numbers, not individuals. However, if you ask about a specific brand of printer, and do not opt out, we forward your request to a pertinent sponsor so you can obtain follow-up from that brand, since we ourselves do not have enough personnel to respond to each reader by telephone. But we do not provide your personal information to outsiders and our survey form has an opt out check-off box which we honor.

FLAAR also serves as consultants to Fortune 500 companies as well as smaller companies and individuals who seek help on which printers to consider when they need digital imaging hardware and software.

A modest portion of our income comes from our readers who purchase the FLAAR series. All income helps continue our tradition of independent evaluations and reviews of inkjet printers, RIPs, media, and inks.

We hope you have enjoyed this report. Please realize there are several levels of FLAAR Reports: from Fast Facts through "First Look" through "Third Look" to factory visit and site-visit case study.

But for any printer where we have access to the headquarters to interview the people who designed and built the printer, access to all documentation, and ample time to quietly and without stress look at every part of the printer and do test files in a demo room, we strive to have a complete report.

When documentation is not provided by the manufacturer, we do our best to obtain it as best as is possible.

Reports written during 2007 tend to be more comprehensive than reports of earlier years, since we gain abundant experience over time.

The purpose of this specific report is to show our readers a sample of what we can produce when full documentation is available. As soon as a site-visit case study can be arranged, we will add this aspect. But if you look around the Internet, and in trade magazines, other than PR releases and an occasional "Success Story," there really is not adequate information available on any UV-curable inkjet printer.

We are proud to offer a unique service, and hope that you will go to our www.wide-format-printers.NET, to the link on UV printers at the right, and order additional FLAAR Reports on UV printers.

If you wish consulting services, this is available. If you simply wish to ask a few questions directly, once you order a requisite number of reports, we provide the telephone number and e-mail so you can contact Dr Hellmuth directly to ask your questions.

You can also contract his consulting services at a trade show, and walk the floor with him. When you enter a UV printer booth with Dr Hellmuth, you will get a level of attention from booth managers that you quickly notice.

Citing and Crediting

A license from FLAAR is required to use any material whatsoever from our reports in any commercial advertisement or PR Release.

If you intend to quote any portion of a FLAAR review in a PowerPoint presentation, if this is in reference to any product that your company sells or promotes, then it would be appropriate to ask us first. FLAAR reports are being updated every month sometimes, and our comment on that product may have been revised as we learned more about the product from end users. Also, we noticed that one company cited the single favorable comment we made on one nice aspect of their printer, but neglected to cite the rest of the review which pointed out the features of the printer which did not do so well. For them to correct this error after the fact is rather embarrassing. So it is safer to ask-before-you-quote a FLAAR review on your product.

The material in this report is not only copyright, it is also based on years of research. Therefore if you cite or quote a pertinent section, please provide a proper credit, which would be minimally "Nicholas Hellmuth, year, www.FLAAR.org." If the quote is more than a few words then academic tradition would expect that a footnote or entry in your bibliography would reference the complete title. Publisher would be www.FLAAR.org.

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Introduction to UV Curable Inkjet Flatbed Printers

Anatomy of a UV-Curable Ink Printer

FAQ of UV-Curable Flatbed Printers

FLAAR Reports: Past, Present & Future UV Printers for 2006-2007

FLAAR Reports: Learning about UV Lamps & UV Curing For Understanding Flatbed Inkjet Printers

How does a UV-Curable Printer differ from a Solvent or Eco-Solvent Inkjet Printer?

FLAAR Reports: Classifications of More than 60 UV-Curable Inkjet Printers

2005-2006 Updates on UV-Flatbed Printers

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Comparative Chart, Feature by Feature, of UV-Curable Inkjet Printers

FLAAR Reports: Classifications of More Than 60 UV-Curable Inkjet Printers

Flatbed Printers with UV-Curable Ink

FLAAR Reports: Past, Present & Future UV Printers 2006

UV-Cured Inkjet Printers

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Vutek PressVu UV 320/400

Leggett & Platt Virtu

Sericol
Inca Columbia Turbo
Inca Columbia
Inca Columbia 220

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