How to Buy a UV-Cured Inkjet Flatbed Printer

FAQs: Questions to Ask Before you Decide Which Brand of UV Curable Flatbed Printer to Purchase

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FLAAR Reports

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Content

Introduction

This report is dedicated to assisting people who wish to learn more about UV-cured ink flatbed printers, especially usability, capabilities, functionality, and usefulness for specific applications. This information is also applicable to roll-fed UV-cured printers.

We have noticed that several kinds of individuals and corporations ask for FLAAR Reports:

- End users who seek help infiguring out which brand or model to buy
- Managers, employees, and executives of companies in digital printing who find these FLAAR Reports useful in learning an independent perspective.

There is no other institute dedicated with such enthusiasm to this UV-cured inkjet technology. This interest is in part because Dr Nicholas Hellmuth has

Dr Nicholas Hellmuth inspecting the assembly of the printers at VUTEk factory

a background in architecture, museums, and education. UV-cured ink printers are ideal for decorating floors, walls, ceilings, and furniture. UV-cured images are a god-send for museum curators who wish to show exhibits in sturdy printed format. For example, archaeologists can recreate ancient murals, stelae (stone monuments with inscriptions), and can even recreate ancient structures with models decorated with UV-cured inks.

But which printer?

There are more than 60 UV printer models to chose from, and new ones every trade show. Since FLAAR itself is interested in selecting which printer we would prefer to use for creating museum exhibits and architectural decoration, we have a program to evaluate UV-cured ink flatbed printers. We felt it would be useful if we shared the criteria on which we work to better understand which printer is appropriate for which tasks.

This 2008 edition is an updated version from 2007
This set of review standards has been updated based on spending

- 10 days checking out UV-curable inkjet printers at DRUPA 2004 trade show in Dusseldorf, Germany.

- 6 days inspecting UV-curable printers at Photokina 2004 trade show in Cologne

- 4 days checking out flatbed printers at SGIA 2004

- 4 days asking pointed questions about UV-cured ink printers at GraphExpo 2004

- 4 days of checking out printers at Graphics of the Americas trade show, 2005

- 3 days of scrutinizing UV-flatbed printers at ISA trade show 2005.

• 5 days looking closely at UV-cured inkjet printers at FESPA in June 2005.

• 5 days[1] learning about UV-cured inkjet printers at VisCom Duesseldorf, 2005

• 3 days seeing new UV-cured inkjet printers at VisCom Milan, November 2005

• 4 days looking at UV printers at SGIA 2005 (1 day during set-up; then the 3 day show itself).
• Two days at Graphics of the Americas in early 2006.

• 3 days running a UV-curable inkjet printer workshop in Athens, Greece, March2006.

• 2 days inspecting UV printers at Pro-Digit@l in Lisbon, March 2006.

• 4 days inspecting UV printers at ISA 2006: 3 days of the show and one pre-show day.

• 5 days inspecting UV printers at FESPA Digital: 3 days of the show plus two pre-show days.

  As exhibitors we were in the halls for the two pre-show days.

• Multiple days inspecting UV printers at trade shows in Spain and Turkey in late 2006

• Many site-visit case studies in Europe, Canada, and the US during late 2006, all 2007 and early 2008.

• Many visits to the factories where UV printers are manufactured in the US, Canada,
  Europe, Taiwan, China, and Korea.

Why do we offer this specific present publication?

This FAQs is to assist companies that seek help in determining which UV printer to purchase. Every month companies have asked FLAAR for consulting services relative to selection of which brand of UV-curable flatbed printer to purchase.

These are usually either screen-printing companies, companies that print on packaging, sign companies, or interior decoration companies who wish to print directly on home furnishing items.

FLAAR is still available as a consultant and can consult with your company at our facilities, at your facilities, or by accompanying you to trade shows. Some companies even ask for all three options. By going with you to a trade show, that way we can both get you into the back rooms as well as translate the advertising jargon into reality for you.

The first question of course is whether to go with UV-curable flatbed printers at all, which we can discuss this with you. This question is more common than you think.
Once this decision is crossed, the question is whether to buy now or wait for the prices to drop further. But you don't save money by not having a printer that you need now. If you make a move today, you should be able to earn enough to cover the higher cost of today's machines.

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[1] *The trade show was only 3 days but since FLAAR was provided an exhibitor's pass, we had two extra days inside, as the UV printers were being assembled. This is a learning experience that you will seldom experience otherwise.*

The next question is whether to

- pay today's $250,000-$550,000 price for a top tier US or European model,
- go for entry level $63 to $65K (yes, there is no such thing as a UV printer for under $63… by the time you pay all the lines that get added onto the invoice).
- go with a low bid Chinese printer with poor resale value
- or an American mid-range model for $75,000, such as ColorSpan.

Your tech support personnel in your own company will answer this question for you. Would you buy a car from an unknown brand name on mainland China? The same reasoning applies to a $60,000 to $150,000 printer from an unknown company which (as far as I could see) failed to show up for their exhibit stand at ISA 2005 (and missed SGIA 2004 also). There are too many half-finished printers; stick with the printers with a proven track record, as well as trust a company with a comparable track record.

I lived in Austria for several years and knowing that the Durst Rho is manufactured in Austria tells me a lot about its European quality. Durst itself is an Italian company and the factory there is quite impressive as well. I spent a week in the two factories.
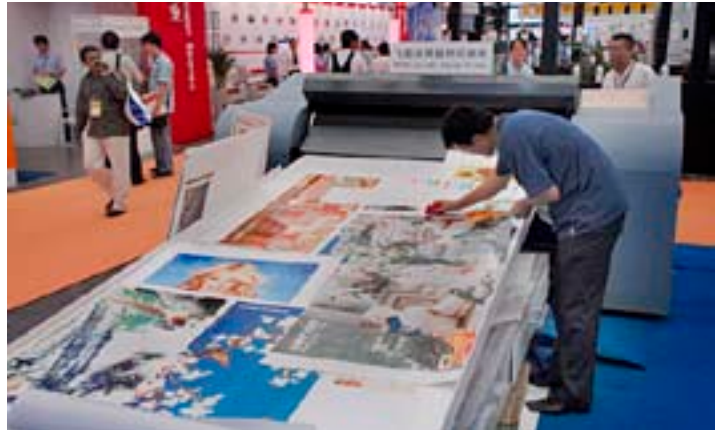
SkyJet Cylinder Digital Printer at Shanghai 07

As soon as we learn more about the design, engineering, and construction of the Chinese and other low-price UV-curable flatbed printers, we will update this portion of the FLAAR Reports. DGI (from Korea), for example, is beginning to produce some nice equipment, but about half of the machines we saw at SGIA '02 and ISA '03 from mainland China were simply not finished. As recently as 2007, half of the UV printers from Chinese manufacturers were still unfinished when compared with models from Taiwan and Korea.

At ISA 2005 it was a similar story. All kinds of UV-curable flatbed printers from China, but the ones from Korea looked more substantial. Even the Chinese printers with US partners, but with the machines assembled in China, these were still not finished in early 2005. The promised delivery date has continued to slip. Plus the price on low end models is not the actual full price. The price quoted on the brochures may not be the real price that you get on your invoice after you realize all the things that the "price" did not include. Such as a warranty after the 90-day warranty evaporates. The true, actual cost of any printer is described in our separate report on how to understand the pricing structure of UV-curable ink flatbed printers.

But at FESPA 2005 trade show (summer 2005), many of the printers that were "unfinished" in earlier years, were now mature, and were noticeably improved in quality. We recommend you get your hands on the FLAAR Reports on individual printers before you decide which printer to purchase. www.wide-format-printers.NET shows more than 33 reports on UV-cured ink flatbed and roll-to-roll UV printers.

Today, in 2008, Korean and Taiwan UV printers have reached the levels of US and Europe. ColorSpan UV printers in 2007 probably had more service calls than most brands from Korea. But so far only two brands of Chinese UV printer have reached the point that their lower price is worth taking a risk on them. But even if you are looking at a printer manufactured in Switzerland, the half-million dollar Luscher UV printer was a total failure. So the present FLAAR Report is intended to be a manual to assist you to help decide which brand and model to skip, and which brand and model to add to your short list.

THE BASICS

1. Brand name, model?
Be aware that the brand name may not be the actual manufacturer (see below).

2. If there are two or three (or more) widths of this printer, what differences exist other than the width?
The Spuhl RS25 and RS 35 differ from each other only in their width. But the HP Scitex XP2700 UV and HP Scitex XP5300 UV are totally different machines. Naturally they share some features, but essentially they are two separate printers. Their designation for 2008 is an HP Scitex set of numbers.

So although many models are identical other than width, some differ in significant way (the NUR Expedio 3200 can accept flat materials; the NUR Expedio 5000 is never intended for any flat materials: it's exclusively for printing billboards and banners).

HP Scitex XP5300 UV

HP Scitex XP2700 UV

3. What is the nature of the company?
Is this company the manufacturer, distributor, or rebranding a machine made by someone else?
Agfa-branded solvent printers were built by Mutoh, not by Agfa. Epson printers are built by Mutoh too, but designed by Epson. Portions of the Eastech Scutum UV are reportedly built by Mutoh. The short-lived Graphtec flatbed was built by Mutoh as well. Yet ironically Mutoh itself has no UV printer of its own! Mutoh UV printers up to 2008 were made in Korea!

In some cases Mutoh itself just manufacturers the printers. The designer may be a completely different company. Most UV printers were designed by an integrator. An integrator specs out a printer based primarily on standard parts, taking into consideration which markets and applications the "manufacturer" wishes to reach. Yet Agfa solvent printers are not only built by Mutoh, they are 99% Mutoh printers. All that is "Agfa" is the name plate and in some cases the ink recipe.

This is not bad whatsoever, but it would be helpful if there were more information on who manufactures what. A few companies design their own printers in-house, and have their own manufacturing facility adjacent to their headquarters. Vutek and Durst would be both in this classification, although obviously each company, and their printers, are completely separate from each other.

Who actually manufactures the printer is more of historical or classificatory interest, though you can perhaps judge quality issues based on which factory does the manufacturing. CrystalJet and the Kodak 5260 are the only two printers that seem to have had major problems during the manufacturing process, though obviously these problems originated in features that had problems in the underlying technology.

4. What other printers are the same or similar chassis from this manufacturer or distributor?

Sometimes a new model is just an attempt to give the appearance of an improvement. So Kodak took their old Encad NovaJet 1000i and simply rebranded it the Kodak 1200i. We thought, wow, a new printer. We asked the local dealer. He said "it is the same old Encad 1000i, just with new software RIP options and media package." Kodak's Encad division went belly up within a few months.

So you do need to keep track of the model numbers. Zund has gone through a number of changes of model designation, and I am still trying to figure out whether the 215-C is probably the same as earlier models, just with a different number. DuPont changed the name of their printer twice: first they got rid of the Chinese Flora designation (Flora FUV 2214 or 2200, which was on the printer at DRUPA 2004). Then there was an intermediate name, DuPont DCC 22UV. DuPont admittedly did make over 100 mechanical or software improvements. The final name under which the printer was released is the DuPont CromaPrint 22UV. Probably 25% or 40% is still from the Flora original, though with better quality control.

5. Is this same model(s) rebranded and sold under other names?

Printers made by Mutoh Europe are sold as Xerox, as Oce, or as Mutoh printers: they are all the same Mutoh Falcon whatever; the only difference is the label, and sometimes the price and tech support.

6. What other printers of other brands are comparable?

Sometimes a printer is unique: nothing else is comparable (Scitex Vision CORjet and Scitex Vision TurboJET (now both with HP Scitex model designations). But if you compare Chinese-made UV printers, you can find many that are simply retrofitted solvent printers (these are called hybrid design).

7. How does this model compare with comparable previous printers?

Is this model a completely different technology (like the Durst Rho 350R cationic ink or the Inca Spyder 150 with its LED lamps as a UV source)?

Or is the new model only a slight tweak of software and add-on hardware, but the basic underlying chassis is still effectively identical to the old model? The HP Designjet 5500 is barely any improvement relative to the HP 5000. The older HP 5000 is rock-solid; most users find the 5500 essentially the identical printer (and also a legendary workhorse). We have three of them, so can speak from experience.

Or was there no earlier model to improve on? The Gerber Solara is effectively a brand new printer; there is no earlier solvent ink printer that is the identical chassis (though surely the insides share many features with earlier parts that proved good in solvent ink printers of other brands).

Or is the new model just a new name, hoping you won't recognize it is really still the same old printer that used to have another name (Kodak 1200i is essentially the same as the Encad NovaJet 1000i). The Graphtec solvent printer is the same as an Infiniti solvent printer, with perhaps a tad better quality control (we hope).

8. If this is a rebranded printer, what features are different than the original printer?

90% of rebranded printers are identical to the original brand; the only difference is the color and the name glued onto the printer. The Fuji Acuity is the identical printer as the Oce Arizona 250 GT.

An occasional exception are American versions of Chinese printers. So the early models of the Raster Printers had many features not on the comparable Flora in China.

9. If this is a rebranded printer, what features are the same as the original printer?
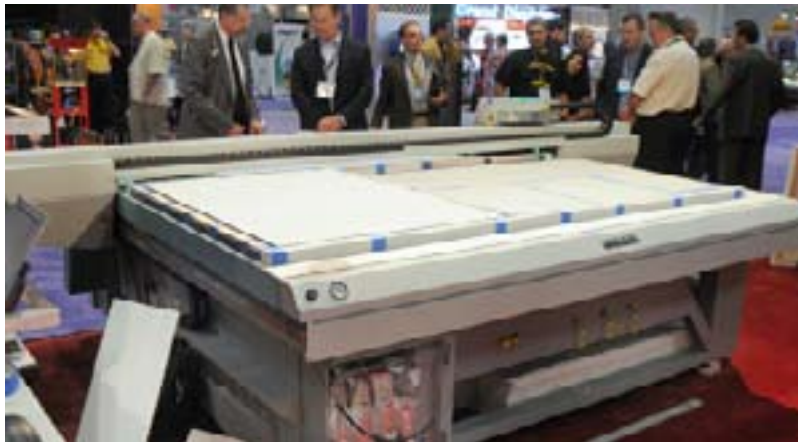
Fuji Film Sericol Acuity HD
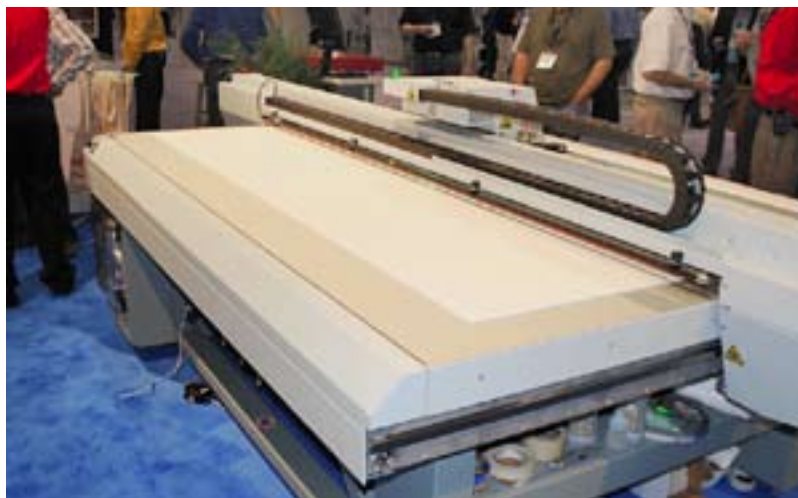
Oce Arizona 250 GT

10. When and where was this model first introduced?

The Zund 215 and Scitex Vision VEEjet are the two oldest technologies that I can think of at the moment. The Durst Rho 350R is among the newest technologies. The Agfa :Anapurna is so new it is not yet finished; and among the most exciting. The Agfa :Dotrix is among the oldest but still the most interesting UV-curable ink technologies. So merely being old does not always mean being out of step with advances: the Agfa :Dotrix is one of my absolutely favorite printers. That said, you will tend to do better when you are investing in new technology. If you are buying old technology, be sure either that the price is correspondingly fair, or that the old technology was so advanced in its day, that even in 2006 it is still pertinent. Again, I would rate the Agfa :Dotrix high in all these aspects.

11. Is there enough new on this printer to make it worthwhile buying it if I already have another recent model?

If you already have an Epson 7600, it is not worth it to buy the Epson 7800,

12. Is this printer mature or still in alpha-stage or beta-stage?

Some printers are released while still in beta-stage (the early Zund 215; the Zund 250). Other printers are mature before they are unleashed (ColorSpan 9840uv). If you want to be on the bleeding edge, buy any printer that is not really out of beta stage. Whether made in China or Switzerland, a printer that is still in beta stage generally does not work adequately in a production facility. Anyone who bought a Kodak 5260 printer, or a CrystalJet, found this out within a week or so.

At present virtually all Chinese-made UV printers are in alpha-stage or painful beta-stage. All Korean UV printers are mature. Printers made in Taiwan vary, but most GCC and Eastech models are advanced beta-stage or are mature.

13. List price?

The cheaper the printer the more likely it will have hidden costs. A hidden cost is a cost that is not printed clearly in the main brochure or any cost that appears on the invoice but does not appear in the main brochure, and on the brochure specifically added up to reveal the final total cost.

The most painful hidden cost of a Chinese UV printer is time lost while the printer is down, waiting for repairs.

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

Be sure to understand all the accessories that you will need. We do our best to itemize these in the evaluations of each brand and each model.

15. What other costs are involved?

Surprise, surprise; your invoice may have several expensive surprises.

16. Does a complete set of full-sized ink cartridges come with the new printer, or merely a "starter set" that is not as full as a regular set?

Most printer manufacturers include a complete set of ink. Gerber even includes two sets of ink. But Roland reputedly includes no ink at all with their solvent printers.

Needing a set of ink throws another thousand unexpected dollars onto the invoice. Find this out in advance.

Ink cartridges of Mimaki JF 1631 at Fespa 07

17. What other equipment is needed to operate this printer? For example, does this printer include its own power line conditioner?

This question is a reality check. The better printer companies have a "Site Preparation Guide" which lists all the things you need to have on site before the UV printer can arrive.

18. Do you need an uninterruptible power supply (UPS)?

Almost all UV printers require negative pressure to keep the ink from dripping out the printhead nozzles. If the power goes off completely, you culd lose the negative pressure, and ink would drip out.

Although a UPS unit is not a major expense, a giant and powerful printer would require a substantial UPS unit, though on "standby" the power requirements should be less.

Some UV printers include a UPS unit inside the printer housing.

19. Do you need to provide air pressure for negative pressure for ink in printheads?

Sometimes the printer itself provides equipment to create and maintain negative pressure, but often you need to provide this yourself. Cost is about $160 to $250. The problem is that air pressure pumps are exceedingly noisy. This noise is especially a pain in the head because the pumps turn on only occasionally, with a noise that is ear splitting.

20. Is an air suction system needed to be installed as a separate item, or is all the vacuum table or other vacuum requirements already included in the printer itself?

Most entry-level or mid-range printers supply their own internal air vacuum for the vacuum table or whatever system provides at least a semblance of a vacuum for under the media you are printing on. Most high-end printers require a heavier duty outside source of air pressure that the print shop must install.

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

Reportedly when you buy a VUTEk there is a spare parts kit, literally, required. You are supposed to have this spare parts kit so you, in your own print shop, can quickly replace things.

Well, since every printer manufacturer does have records of everything that tends to break down on their printers, at least this is an admirable admission by VUTEk and does make it less costly and quicker to do the repairs… no emergency FedEx overnight shipping fees. However having a spare parts kit be a requirement seems like an admission of which parts don't hold up well.

The positive side of this policy, and one used by some other printer manufactures in addition to VUTEk, especially complex expensive high end printers, is that the end-user stocks the spare parts so that there is no wait for them to be ordered, shipped, and received.

But some manufacturers, whose printers have Swiss-like quality, smile when they hear of required purchase of spare parts when you buy a VUTEk. Yes, naturally, even Swiss equipment wears out and breaks down occasionally, but probably not as often as most American made UV printers.

Having a set of extra printheads is considered both acceptable and a good idea because your printheads can go bad as a result of an accident (head strike) that is not entirely a fault of the manufacturer of the heads or the printer. However a printhead should have a recessed position so it can be to some degree protected from what should be somewhat preventable head strikes. When you have a spare set of printheads in-house, then when your regular printhead goes bad, you send that back to be repaired, slip in the spare printhead, and then you get back your own former printhead repaired. At least you know the history of your own printhead (how many months or years it has been in use).

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

The end-user is generally not encouraged to take the printer apart and do repairs on their own. Only later on, when you have considerable experience, and have taken advanced tech support training, would doing your own repairs be realistic. However I have visited many printshops where the printer operator prefers to receive this training precisely so they can do their own repairs. After all, if the manufacturer can train their own tech support person surely a printer operator, who also works with this printer every day all month all year, can also learn how to maintain and repair it (if they have the interest and inclination).

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.

23. What is the cost of a spare parts kit?

My memory has the price of $20,000 for the VUTEk spare parts kit, but it may be more or less now-adays.

24. How does the total cost compare with other UV printers?

The cheaper the printer, the more likely it's quoted price is "bait-and-switch." The bait is the cheap price that is quoted. The switch is that once you place an order, you find out you have to pay for so many other things that the total invoice is considerably more money than you had thought of. A spare parts kit is one of many shocks that hits the first-time buyer.

You can fill out the other columns for the brands of printer that are on your short list. We can't fill this out for you, since we don't know what is on your short list.

Base price, chassis and print engine				
RIP Software, lite				
RIP, full version				
transportation				
installation				
training				
ink				
warranty				
spare parts kit				
table(s)				
Total cost				

PURCHASING

25. 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?

For some brands the manufacturer tries to refuse to provide service, saying it is up to the dealer. For other brands (ColorSpan), the primary backup service is straight from the factory, but in large cities the local dealer should be able to handle you acceptably. But if for whatever reason not, then the factory provides backup without hassle in most cases. Now that ColorSpan is part of HP, I hope their MacDermid-like tech support policy continues.

If the home office refuses to provide tech support and forces this issue on local dealers, I would check with several other end-users to find out if the local dealer's tech support is adequate.

26. What kinds of leasing or other financing are available?

This situation varies by country and by printer and by situation, so we can't comment on your local situation. Most people lease their printers, but other printshops buy them outright.

FEATURES OF THE PRINTER: Vacuum

27. Is there a vacuum function?

A vacuum of some sort is required to hold down the material.

28. Is the vacuum created by simple fans, or by an air pump?

Low-bid printers have simple fans; better systems use an air pump. Nonetheless, many vacuum systems have some good features and a few weak aspects.

29. In how many sections?

Cheap printers have the vacuum in one section all the way across. Better printers have the vacuum in user-definable sections.

If the vacuum is in one long section (without divisions), then if your material is small, your vacuum is sucking against nothing, and wasting it's sucking power. In this case you have to put some other material to cover over the unused section of the vacuum, so that the sucking power can be available on the smaller piece of material you are trying to print on.

30. Are the vacuum areas (size and position) user definable?

In some high end printers, the user can define the size and position of the vacuum area.

31. Can you turn one or the other section(s) off and on?

If there are sections, usually you can turn them off or on. Otherwise having sections does not provide much of an advantage.

32. Just Off and On? Or variable?

Off and On capability is adequate for entry-level printer. A good mid-range and all high end machines you should expect to have the capability of variable power for your vacuum.

33. Does setting a substrate profile activate a higher or lower vacuum automatically?
It naturally helps if the printer, on its own, already knows what setting of vacuum sucking power to set, based on the kind of material, and its size.

34. Can the vacuum be too strong for thin materials, and cause them to deform?
Yes, this is an issue on some vacuum systems; this is the sort of issue you will find out only after you have used the printer for a few months. So, before you buy it (before you pay for it), test every single material that you might possibly use, so learn which materials are problematical.

35. Is the vacuum too weak for some materials? Does this mean you have to waste your time and tape materials down to the top of the flatbed table?
Almost every time I see the Mimaki JF-1631 UV flatbed in operation, the operator has to waste his time to tape down the material, sometimes on all four sides. This is inexcusable.

FEATURES OF THE PRINTER: Vacuum

36. Is this a dedicated flatbed with no roll-to-roll capability? Or is this a true flatbed or just add-on feeder platforms at front and back?
The cheaper the printer, the more likely it's quoted price is "bait-and-switch." The bait is the cheap price that is quoted. The switch is that once you place an order, you find out you have to pay for so many other things that the total invoice is considerably more money than you had thought of.

You can fill out the other columns for the brands of printer that are on your short list. We can't fill this out for you, since we don't know what is on your short list.

37. Is there a moving transport belt (combo style) or a stationary platen (hybrid style)?
There are pros and cons of a transport belt; there are positive and negative features of a stationary platen. So learn, from a site-visit, which is the reality for the printer(s) that you are thinking of buying.

38. Describe the platen.
Platens do vary in size, material, and quality of workmanship.

39. Are their edge guards at each side (end) of the platen? At left, or at right, or both?
Edge guards are helpful to guide roll-fed material and protect from having a head crash against an upturned edge of the material.

40. Can you move the left guard, or the right guard, or both?
In almost every instance you can move the edge guards to needed positions, if they exist.

41. 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?
Most cheap Chinese printers, such as the Infinity models, are really just old solvent printers with UV systems stuck on them. This we call "retrofitted" but for the earlier models the word jerry-rigged is more accurate.

If a printer was originally made to handle roll-fed materials, and now the manufacturer has simply added a roller-table at front and back (to suggest it can handle thick rigid flat materials), you better check to see at what point the former solvent-roll-fed system can grab and hold a thick rigid board.

STRUCTURE OF THE PRINTER: Transport Belt

42. Describe the transport belt? What material? What manufacturer?

The Zund 215 has a transport belt. The Dilli Neo UV printer has a transport belt too, as do several other combo style UV printers. The only comparable printer that lacks a transport belt is the Neolt, Keundo UV, and Mutoh Zephyr, all of which are hybrid designs. But unless there is a source of information that tells you these details, and explains why they are significant for your print shop, there is no intuitive way to understand the pros and cons. We describe the Neolt printer in our detailed report on this machine.

Printers that are retrofitted from being a solvent printer chassis tend to have a simple platen. So a conveyor belt demonstrates that the designers have tried to make this printer more than "just a solvent ink printer with a UV-lamp added next to the printheads." A printer with a platen, pinch rollers and grit rollers is called a hybrid UV printer.

Dilli Neo Venus transport belt

43. Size, does it stick out?

Some transport belt systems stick out of the overhead housing; others do not. Of course some of the cheaper transport belt systems don't have any housing on top to begin with. Whether or not a transport belt sticks out is not (yet) documented to be a a plus or minus one way or another.

44. Why did your designers select this structure for the transport belt?

A combo printer uses a moving transport belt instead of grit-rollers. A moving transport belt has it's own pros and cons. MDO boards can skew if fed in the narrow dimension (even on a $300,000 big-name brand printer such as a VUTEk 200/600). Some transport belts "wander" (the word used by the owner of a GRAPO Octopus in Australia). This is not serious for roll-fed materials, but is not good for flat materials. That owner went and bought a dedicated flatbed, so he has no more skew of rigid materials.

 So yes, all UV printers can print on everything, but not all UV printers can move every different kind of material through the printer with perfect precision.

45. How well does this belt hold up to heavy use? Does it 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.

Several other UV printers have an infamous record of belts that may be so unstable that they "wander."

But with even the combo belts that are considered acceptable, some materials will skew: depends on belt usage, wear-and-tear, on material weight and surface characteristics, etc.

46. If a combo-design, with a conveyor belt, does the texture of the belt, with a heavy vacuum, leave a banding imprint on the surface of any thin lightweight material?

You need to ask someone who already owns the printer about this aspect. This issue is rare, but does happen.

47. How often does the main flatbed transport belt need to be replaced? At whose expense? What is the cost of a replacement belt?

One printshop that we inspected had to replace their transport belt four times (DuPont Cromaprint 22uv, known for its early transport belt problems). At least DuPont was honorable and covered the cost of the replacement itself. Now that DuPont has pulled out of UV printers, the people who bought this printer may have to pay over $2,000 per new belt!. In comparison, the replacement belt of a Dilli UV printer costs about $400.

48. What does the transport belt area of the printer look like under the belt?

Usually the belt is flat across the underside, in 90% of all printers, because there are only two rollers: drive roller and driven roller).

49. What is the procedure for removing the old belt and putting on a new transport belt?

If your belt needs to be replaced frequently, you better hope that changing it is easy. Some belts will last for years; other belts last only six months. The way to find out is to ask printer operators who already have the brand you are interested in.

Durst Rho 800 UV printer at Lienz factory. You can see the grill on top of wich the transport belt will be placed.

50. How many rollers control the belt: is the path of the belt horizontal, or triangular?

You should expect at least one drive roller and one driven roller, one at the front the other at the back. In between is a rectangular horizontal vacuum bed, essentially the same kind of bed you get on a dedicated flatbed printer.

The IP&I Revo has three rollers; the IP&I Cube260uv has four rollers that control the transport belt. This adjustment and alignment control system on the IP&I Cube UV printers is the most sophisticated I have yet noticed.

51. Which is the drive roller for the transport belt (where is the motor and what kind of motor turns the transport belt?

This you can see for yourself by looking at the printer, though sometimes the motor is not easily visible (if it is under sheet metal housing).

LINING UP FLAT MATERIAL (to help it feed straight)

52. How is rigid media fed?
This depends on which kind of printer you have: dedicated, hybrid, or combo. Not all UV printers are intended to handle rigid material.

53. Is a feeder-stacker option available?
The Durst Rho was among the first manufacturers to offer a feed-stacker. Scitex Vision also offers a feeder-stacker for its CORjet (the CORjet is water-based, not UV-curable).

54. What kinds of raised guide bars along the side of the table exist? Left or right? How long?
Many early printers lacked adequate guide bars. The newer version of the ColorSpan 72UVX now includes an innovative alignment and guide bar system. Some more expensive printers still lack this level of sophistication. So merely having flatbed tables is not enough to handle MDO boards or even foam-core material.

Zund 250 UV printer at demo room. Alignment of the flat rigid material

55. Are there specially accessories on or above the side guides, or are they just a raised guide.
The side guides come in many sizes (height and length). Normally they are just a raised guide (of metal). But sometimes they have auxiliary accessories.

56. Is there a registration gate that is lowered across the back printing area?
Most printshops report that most rigid media is crudely cut and rarely are the edges really at 90° to each other. So you don't really want to align a corner, you want to align one side (or one end).

57. Where is the registration gate located? At the back? Under the carriage? Or in the front?
There are no standard positions for where a registration gate might be located. Some are easy to find and use; others are frustrating. You have to experience this yourself. If you are the printshop owner or manager, you might want your operator to test-drive a printer before paying for the machine. You as owner don't have to face the issues of the printer 8 hours a day, as does the operator.

58. Does the drop-down gate have special fixtures for placing or measuring position of materials that are set against it?
Registration gates come in a dozen different sizes and with a bewildering array of accessories. Some work; others don't, and usually at least one accessory is missing.

59. Does the drop-down gate have moveable features to assist in registering materials?
The comment above applies here.

60. Does the drop-down gate have features to facilitate placement of multiple small materials against it?
The ColorSpan 9840uv was the first where I noticed this positive feature. Then the Durst Rho 800 made a special issue of this capability.

61. Can you be feeding or aligning new material at one side of the printer while the previous job is still printing out the other side?
If you have a dedicated flatbed printer, you can't load new material while the job is still printing. If you have most hybrid and most combo systems, same situation: you can't load a new board fully into the system until the previous job is completely out the other end. But with the Durst Rho 800 (and a few other recent systems) you can load-while-still-printing.

62. Is two-sided printing realistic? Is there a special mechanism for registering the position of the image on the second side?
No matter what you are told, or promised, at the beginning, the reality of doing two-sided printing will hit you once you use it daily. Some printers do this well, some okay, some are simply not ideal.

63. Do you have to hand measure the media height, to enter it manually into the software?
In most cases you have to manually measure every piece of thick rigid material, and enter these measurements manully into the software. Of course the more expensive machines do much of this for you.

64. Do you have to measure the media size (width and length) manually and then enter it yourself into the software?
If you have to measure the width and length of each board, in addition to measuring its height, then you have a lot of time-consuming preliminaries for most print jobs.

All this means that your print production speed is impacted, because you have to waste time doing all these preliminaries. Your print speed is zero while the operator is measuring things by hand.

FLATBED ASPECTS (for dedicated flatbeds)

65. If a dedicated flatbed, how many sections is the flatbed divided into?
Most dedicated flatbed printers have a table that is one solid section. But larger tables, such as the excessively large table of the Luscher JetPrint, are in sections.

66. If a dedicated flatbed, do the edges (joins) of the sections of the table cause a noticeable imprint on thin material?
This is rare factor that you might wish to check for on the huge Luscher flatbed.

Luscher JetPrint

67. How much weight can the table hold?

If a table is simple aluminum, with empty space beneath it (for the vacuum system), this table may not hold much weight. If you need to print on stone, you need a table that can handle this weight.

68. Is pin registration present? How many pins? What is their position(s)?

The Zund 215 has a single pin; The Gandinnovations flatbed has at least six pins. Pins are used to align rigid materials, especially if you wish to print double-sided. Pins tend to be present primarily on dedicated flatbed printers. I do not normally expect pins on a hybrid or on a combo printer (they have gates or side rails instead).

69. If no pin registration system is present, what kind of other registration system is available?

Irrespective of what registration system is available, realize that not all material has 90-degree corners (especially material from the US or China).

70. 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 Inca, Mimaki, Gerber ion, and several Chinese flatbed printers move the gantry across the narrow dimension. This takes longer to print than if you ran the printheads across the wide dimension (as does Gandinnovations and the Oce Arizona 250).

71. What are the pros and cons of a dedicated flatbed compared with a combo printer (with moving transport belt) or hybrid printer (with platen)?

But even dedicated printers have their downsides too; with a dedicated flatbed you (the operator) are idle, totally, while the printer is printing. You can't load or unload anything. But if you have a top-of-the-line combo printer, such as the Durst Rho 800, you can load at the back while the printer is cranking the previous job of flat material out the front: this can print and load and unload all at the same time. I have seen this ability to feed-while-printing also with the ColorSpan 9840uv (HP Scitex FB910).

But with a dedicated flatbed printer, there is no alignment issue just because the media is not cut squarely from the factory. Poorly cut material is a major disadvantage for combo or hybrid printers. So again, the reason there are more than four different classifications of UV printers (hybrid, combo, dedicated flatbed, dedicated R-t-R) is because each has pros and cons.

In theory, the perfect printer would be a dedicated flatbed with a dedicated roll-fed system across the long axis (Gerber unfortunately is trying this across the short axis). Oce has not yet gotten their roll-fed device to function to the satisfaction of printshop owners (based on a quote from someone who owns two of the Oce flatbeds but who bought a $400,000 combo printer so he could handle all media types on a single platform).

ROLL-FED

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

If you look into most printers you will see small evenly spaced black pinch rollers (rubber or neoprene-like material) slightly off-set but still moving against lighter colored grit rollers. Grit rollers are exactly as they sound: they have a sandpaper-like gritty surface, and move the material by means of friction. Naturally the surface of each kind of material reacts differently. Glass would be one example.

73. How is roll media fed? Pinch roller against grit roller?

Sometimes the grit rollers are directly beneath a same-sized pinch roller. On other machines a grit roller is offset from the pinch rollers on top. On a few printers the grit rollers are one continuous bar. In some systems the grit rollers have no visible gritty surface structure.

The result is that some hybrid printers feed some kinds of material better than other kinds of material.

HP Designjet water-based printers use a "star wheel" system, which may be in addition to a pinch-grit roller system.

74. Or does the printer use tension rollers instead of grit rollers?

Grit rollers tend to be used for hybrid style UV printers under 2.x meters in width; tension rollers tend to be used for printers of 3 meters and wider. Plus grit rollers are rarely used on a combo style printer because the transport belt is what moves the materials. On a combo printer there is not really a place to put grit rollers since the conveyor belt occupies most of the available space.
Grit rollers at the bottom, working in conjunction with pinch rollers at the top, with a basic vacuum in the middle (under the platen) is to provide you with the lowest possible cost for entry level. But the grit-against-pinch roller system work best on certain materials, and are not perfect with other materials.

75. What size? What positions are the rollers relative to each other?

The Zund 215 has the most complex roller system. But complexity, in and of itself, is no guarantee of flawless feeding. Indeed the Zund 215 has banding issues, though it got better by 2006 with new firmware and other improvements over the years. The Zund was one of the first UV printers ever designed, so they were still experimenting. Curiously, this model was still being sold up to 2007, with not many changes from the 1990's (other than that the lamps don't fry the printheads as much today as they did in 2001).

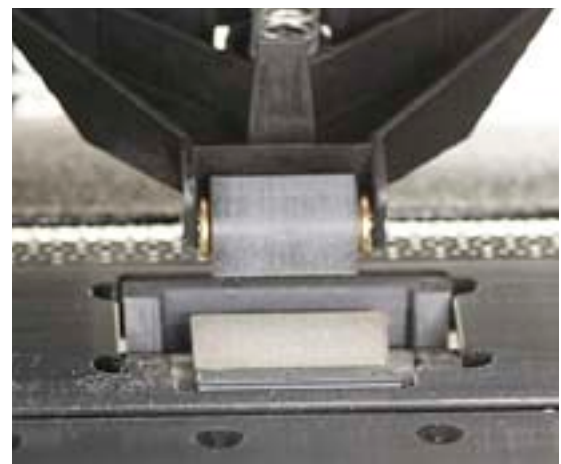### 76. Are the grit rollers continuous or individual?

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

78. How are the pinch rollers raised (when you want to raise the entire row to get media underneath)?

You expect to find this feature.

79. Can you raise an individual pinch roller, on only the entire row?

On some hybrid systems it helps to raise any pinch roller that is over the edge of the media. This can help alleviate skew. So sometimes you would need to raise two individual pinch rollers (one at the left, one at the right). Of course this depends entirely on the width of the material and whether,

ColorSpan 5440 UV pinch rollers

by coincidence, a pinch roller happens to overlap the edge of the media at one side or the other, or both.

80. Can the pinch of the pinch rollers be varied?

The amount of pressure that pinch rollers exert on top of the material is variable in better systems, but non-variable in cheaper systems.

81. If there are no pinch/grit rollers, is the media held by tension?

Large dedicated roll-to-roll UV systems tend to use tension to move the material rather than grit rollers.

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

A saddle is formed of two rolls with a slight space between them. You rest your roll of substrate on the saddle created by the two adjacent rolls. You don't need to run a spindle through the roll. You don't need to fumble loading the end of the spindle into two holders (one at each end). Loading a saddle is quicker as a result. But a saddle is primarily used on heavy-duty industrial printers 3.2 meters or wider where the weight of a roll may cause a spindle to sag. Plus, it's a headache to thread a spindle through a 5-meter long core.

Durst Rho 351R UV printer, an example of the roll-fed system

83. Is there an air (pressure) core system?

Air core spindles tend to be used only on grand-format printers costing over a quarter of a million dollars.

84. How is the roll media handled at feeding position? For example, is there a dancer bar? If there is no dancer bar, is there at least a tension bar?

A tension bar goes up and down. A dancer bar tends to move diagonally. Each one changes position as tension is needed.

85. After the feed roller (or spindle) is there a set of two fixed bars, one above either other (a tension set)?

86. If this is a dedicated flatbed or a combo design, is the roll-fed mechanism an option, or is it included?

Increasingly, even for combo systems, the roll-fed mechanism is an option, and for a system such as VUTEk, the system can be very costly. In mid-range printers the roll-to-roll aspect is included with the original base price.

87. 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).

In over 90% of the printers the roll-fed structure is physically attached to the printer (usually permanently part of the printer). The GRAPO Octopus is one of the few where the roll feeding holder is not attached and is simply parked near the front of the printer.

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

89. On a hybrid system, at the back, is there an extra roller bar(s) near the platen or transport 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).

90. At the front, is there an extra roller bar(s) near the platen or transport 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).

91. How is the roll media handled at take-up position? For example, is there a dancer bar? If there is no dancer bar, is there at least a tension bar?

Usually if there is a dancer bar at one side there is a dancer bar also at the other side, but this is not a requirement or 100% the case.

92. How to you fasten roll-fed media to the take-up reel?
Usually you simply tape the material to the take-up reel with a piece of tape.

93. What about the take-up reel? Does it work unattended?

94. Is a heavy-duty unwinder-winder system available as an option to handle heavy rolls of materials?
Some printers offer extra heavy-duty unwinder-winder systems as an option.

95. Describe the overall path of the media through the system?
A simple path is neither a major benefit nor a defect. A simple path means that it's easier to load and there is less to go wrong. A more sophisticated system may have advantages for feeding some kinds of media.

96. Does material roll up evenly?

97. Does roll-fed media feed evenly?
The most impressive feeding system for media for a roll-to-roll UV printer is that of the Durst Rho 351R. When you see a system such as the Rho you understand why the VUTEk is most politely described as simple in comparison.

98. How much media is wasted during loading and feeding?
With some 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 before you can cut it, resulting in media being wasted before and after cutting, etc.

There is less waste on a dedicated flatbed printer because there is no material used in loading or feeding up to the point it is printed upon.

99. 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. The Durst Rho 351R offers an option to allow printing on two different rolls simultaneously. The NUR Expedio 5000 (now an HP Scitex model number), allows printing on three rolls simultaneously.

NUR 5000 uv at factory visit. This printer has a multi-roll option.

100. For handling ink that passes through the weave of fabrics or mesh, is there a trough? Or other mechanism to catch the ink?

Durst roll-to-roll and Spuhl combo style machines have a trough; the Spuhl is the only combo system that I am aware of that has a trough. Otherwise, a trough is normally available only on a printer with a fixed platen; there is no easy way to put a trough on a combo style printer. If you need to print on fabric or mesh with a UV combo printer (other than the Spuhl Virtu RS 25 and RS 35) you need a liner or you need to put an intermediate sheet onto the surface of the conveyor belt (or clean up the ink that passes through the weave).

101. Is there a cutter? Is it manual or automatic.

Most combo-style printers have no on-board cutters. The Durst Rho 351R has a manual cutter since this is a dedicated roll-to-roll printer (meaning it has no moving conveyor belt). So roll-to-roll systems are more likely to have an appropriate location for a cutting element and even potentially a cutting slot.

102. Is the cutter up near the platen (where cutting residue can eventually clog the printhead nozzles), or is the cutter further out, where detritus is not as much an issue?

An on-board cutter tends to be present only on printers of 64" to 44", with some 24" printers also having an on-board cutter.

103. Is there a "knife guide," a slot where you can draw your knife down and across the width of the substrate?

Most combo-style printers have no area to put such a knife slot.

STRUCTURE: Miscellaneous

104. Does the printer have levels built into the structure of the printer?

The only entry-level or mid-range hybrid or combo printer where I have noticed levels actually incorporated into the structure of the printer are the UV-curable printers of Dilli.

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

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.

106. Does the printer have wheels? How many, and how strong?

The larger the printer, the more wheels it needs. Four wheels is a common number for an entry-level printer; larger machines may have eight wheels.

107. Is the motor a linear motor or a stepper motor?

This and the following question is best discussed with an engineer.

108. Is the carriage moved by a magnetic field or a motor?

Durst and Spuhl (and thus I assume also L&P in the US) use magnetic principles to move the printer carriage.

TABLES for Combo or Hybrid Flatbed

109. What is the approximate size of the table?
The "table" is the thing, usually on wheels, which is rolled up to a hybrid or combo style printer so that flat rigid materials can be lined up horizontally to feed through the printing system. Usually there are two tables: one at feeding side; the other at output side. Normally the tables are identical, but not always (see below).

110. Is this table size adequate?
Most printer companies try to save money by having the tables as small and cheap as possible.

111. Do you need to provide an additional table at the front or back?

112. Are the tables an extra charge, or is the price of two tables included in the original price of the printer?
If the table is physically attached to the printer (and folds up onto the printer when not needed), then obviously the table is included in the price of the printer. In about half the other cases, the tables are also included, even if they are detachable. But in a few cases the tables not only are extra cost, but the extra cost is substantial.

113. 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 such a large roller bar. Both DuPont and Oce changed their roller-bar system for a solid table (DuPont added ball bearings).

Other printer manufacturers have gotten rid of the horizontal rows of thick rollers and replaced them with long vertical rows of mini-rollers (set into the flat vertical bar). ColorSpan has this system.

So the design and implementation of the take-up table is something you need to understand. Simple roller bars have proven not necessarily to be the best design, and are gradually being replaced. You may eventually need a more sophisticated system. See our individual reports for photographs and descriptions. But roller bars, per se, are not bad. And solid tables, per se, are not better. A solid table is simply cheaper for the manufacturer (in other words, they make more profit).

So a sophisticated roller-bar table may be better than a simple solid table. And a simple solid table may be better than a cheap roller-bar table.

Plus, some materials work better on a solid table and others feed better from rollers. You will need to experment, and speak with printshop owners that already have the brand you are interested in.

Of course you pay for any improvements, so you may prefer a low-cost solution, which may imply a traditional set of horizontal roller bars as the design of the tables.

114. If there is a row of rollers set into a bar, can you slide the individual bar to a new position?
It is rare that you can slide any individual bar, or roller, to a new position. The only table that I can remember that had movable features was that on the ColorSpan 72UV printers.

115. Does the table stick out with cantilever support only? Or does the front have legs for added support?
Some Chinese tables are so cheap that at trade shows you see them already broken (at weld points) or bent out of shape.

The following questions vary depending on what table system you are looking at, so there are no generalities. Cheap printers save money by giving you a cheap table. With Durst, you get a solid table. Between Durst and cheap you get all combinations.

116. Are there only two legs (at the front) or are there four supports?

117. Do the legs have wheels, or leveling system, or both?

118. Are the vertical supports (the legs) at the corners or elsewhere?

119. If the table(s) are of roller bars, how are cross-supports situated? Same level as rollers? Or under the rollers?

120. Is the front table (output side) the same as the back table (feeding side)?
The table at the feeding side will at least tend to have an alignment guide bar on at least one side. Otherwise, 90% of the tables are identical front and back (again, this is the lowest cost). But if you are paying over $250,000, and especially at $350,000, your table at feeding side may have several additional features to help guide single or even multiple boards.

121. Why did your designers select this structure for the tables?
A manufacturer will rarely say that trying for the cheapest solution is what caused them to end up with such-and-such a table design. But when there are extra features on the feeding table, then they will explain why.

122. Is the table physically attached to the printer? Or just rolled up close to the printer?
Obviously in most cases the table is physically and securely attached to the printer. But in some instances the table is just rolled up close to the printer and parked.

123. Does the table fold up into/onto the printer?
On the ColorSpan 5440uv series hybrid printers the table cleverly folds up onto the front of the printer when it is not needed. These four models are now handled by HP under new model designations.

124. Does the table fold up and wheel away folded up?
In probably 90% of the cases, the table does fold up, and can be wheeled away folded up. In a few cases of really large tables (or small really cheap Chinese tables), they don't fold up.

125. Or is the table one monolithic structure?
In a few instances (mentioned above) the table is one structure and does not fold up. In a small printshop, to have two such tables, is a pain, because the tables take up losts of space.

126. How much weight can the feeder-table or take-up table hold?
Some flatbed simply can't hold the weight of heavy media. If your table bends, then things will be out of kilter. Yet for a large printer, you will often need to get up onto the table with the weight of your body (this we learned from site-visit case studies). It takes too long to get the table out of the way.

127. How do you handle feeding objects of irregular size, or small size?
The Durst Rho 160 requires trays to carry objects of irregular or small size.

128. Is there a minimum size for a single rigid board?
For most printers the minimum size is letter-size or tabloid size, though there is no hard and fast rule. Most printers can print on a single business card, but you could not feed a piece of wood, stone, or foam-cor the size of a single business card through any hybrid printer. A business-card size would be no issue on a dedicated flatbed (if the software can handle a small image). Most combo style printers should be able to handle small objects, but the vacuum would not really suck on one single small piece of material.

129. To change from roll-to-roll to rigid, what do you have to do?
Changing from roll to rigid can take 5 minutes and be done easily by one person, or can be quite complex and stressful.

130. How long does it take to change from roll-to-roll to rigid?

131. Are their edge alignment bars on the table? At left, or at right, or both?
You should expect that the table at the feeding side have an edge alignment bar at least on one side, usually the right side. But in most cases you can also align thick rigid materials by a drop-down gate that is 90-degrees to an edge alignment bar. Since many sheets are not precisely at 90-degrees at their corners, you generally need to decide whether you intend to align the X-axis or the Y-axis.

132. Can you move the left bar, or the right bar, or both?
Most alignment bars are in a fixed position.

UPGRADES, Future Improvements?

133. What features have been added, or changed since the printer first appeared?
Most printers don't add or drop a feature at all. They are frozen the way they are first produced. Canon, Epson, Encad, HP Designjet are all like this: no intermediate changes, unless you call the HP 5500 an intermediate change from the 5000.

But the RasterPrinters 720UV has changed as it evolved through beta stage over an entire year. The DuPont Cromaprint 22uv also changed dozens of parts over a two year period. The down side of having lots of changes is that this means the original printer had inadequate parts.

134. What features have been added in the last six months?

135. What features are being added, or changed in the next month or so?

136. What features are being added, or changed, further out in time?

137. Are upgrades modular, or are you stuck buying a completely separate new printer?
With early L&P Virtu printers, and with some Gandinnovations UV printers, upgrades are modular. But with most other systems, once the company develops a better, or cheaper, way to do things, they tend to come out with a different model and expect you to buy an entirely new model.

138. What firmware upgrades have been made available?
It is usual to have firmware upgrades. They may take hours to download off the Internet. I always find it easier to ask for the upgrades on a CD.

New firmware software can often significantly overcome earlier problems. Most firmware updates come during the first six months after the printer is introduced.

139. What new firmware upgrades are likely in the future?

Miscellaneous

140. 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.

Most traditional combo style UV printers move rigid materials with the transport belt and move roll-fed materials through a combination of the transport belt and the roll-feeding and take-up rollers.

141. 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.

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

About half the mid-range and high-end UV printers have a fluorescent-type light inside when you open the hood.

Fluorescent light inside the hood

OPERATING THE PRINTER

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

Obviously you don't want to have a UV-lamp running in your shop while you are guiding the printer via the Internet from home. But it does help if people elsewhere in your office can keep track of the printer from their desks. Whether or not you can check the printer from a remote location has to do with the printer firmware and in some instances which RIP software you use.

144. What is the level of ease of use? Can anyone use this printer or do they have to be trained and certified? What about daily and periodical routine maintenance?
Using a printer and doing maintenance on a printer are two completely different aspects for the printer operator to handle. The Zund 215 is probably not inherently more difficult to "use," but I would not want a minimum-wage employee to try to do maintenance on this machine without serious training, experience, extreme patience, and dedication.

145. Is the printer user friendly?

146. What sensors does the printer have?
I have not yet seen a spec sheet, or really even a user manual, that specifically lists all the sensors.

The more things you have to do by hand, the more time you waste.

The more sensors the printer has, the more costly the machine will be.

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

148. In the main area for operation, is the machine software based (touch screen), or with physical control buttons? Or both?
Every manufacturer has their preferences. Durst and Gandinnovations have nice touch screen systems, but generally also offer a keyboard too. The most backward old-fashioned system is that of the Mimaki JF-1631 flatbed: only a tiny rudimentary LCD screen a few inches high.

149. Do you get an LCD screen in the printer or a real computer monitor? How big is the screen or monitor?

150. Is the position of the LCD screen or monitor user-adaptable?

151. Where does the computer keyboard sit?

152. Can the keyboard be moved or is it fixed into the structure of the printer?
Perhaps 30% of the keyboards are movable, but generally the ledge or work area is too small to really allow a keyboard to be moved around much.

LCD Montonitor. Anhui Liyu Eureka 1808 UV at Shanghai 07

153. Is there a drawer under where the computer keyboard is (a drawer for storing odds and ends)?
A drawer or even an open cupboard is a nice touch.

154. Where does the operator stand or sit?
With a few printers the operator is at the feeding side; with other printers the operator is at the output side. Each manufacturer has their reasons for their personal preference. Ideal are the few systems where the work area (namely the computer with its LCD monitor) is on a small table with wheels. This way you can move to wherever you have space in your shop and wherever you find is best for your personal preferences.

155. What aspects of the printer can you operate from behind (the loading area)?

Some printers have almost no controls at the "back" (loading area). Other prints have some controls. Some large sophisticated printers have key controls duplicated, so you can activate a feature whether you prefer doing that act from one side or another.

156. What controls are on either end?

It is rare to have any controls at the end of a printer.

157. Is a foot pedal included (for operating aspects of the printer)?

Perhaps 10% of the printers have a foot pedal.

158. Can you do unattended printing? For how long? How about overnight?

Most print shops would not recommend doing unattended printing when UV lamps are involved, due to fire hazard, or melting some unpleasant material if it got caught under the lamp. Also, unless you have an auto-feeder and auto-stacker at the other end, you could not handle unattended printing of flat rigid material.

As for unattended printing of roll-fed material, again, due to the UV lamps, most print shops would probably not leave the printer on overnight. But if you are doing roll-fed material, even though you can't load another roll unattended, if you have a reliable printer you can do roll-fed (the one full roll) at night unattended if you are willing to take a risk. Several owners of ColorSpan 72UVR and 72UVX printers have said they let their printers run overnight unattended if necessary. This is not officially recommended, but if you have a large job (for roll-fed material), and if you are the only person available to run the printer, it is done more often than I would have expected. On less reliable models trying to run overnight would result in a mess the next day.

But for printing during the day, while the crew has a coffee break or even a lunch break, most places would keep their printer running.

159. How many operators or operator assistants does this printer require?[2]

The Luscher was too large to load and unload by one person. The Luscher had mechanical and other issues as well, and was withdrawn (after about a dozen people got stuck with this half-million dollar machine).

Otherwise, most roll-to-roll UV printers prefer to have two people to load heavy rolls, but otherwise, most roll-to-roll, combo, and hybrid printers can be operated by a single person.

The larger Inca printers work more effectively with two operators. But calculate the cost of having to pay this extra operator. He is working only for loading and unloading.

160. What can you control, as operator?

Some things the printer firmware controls; other aspects the RIP software handles. But you, as operator, need to be in control (unless you prefer the more expensive printers which do most of the thinking for you).

161. Is there a pole with beacon lights?

Dilli was among the first to use a vertical pole with beacon lights. Most other printers do not have such a beacon. Presence of a beacon is not a major plus point; absence of a beacon is not a significant minus point.

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[2] *It is worth noting that several printers that have failed to function adequately: for example the Encad VinylJet, the Kodak 5260, Luscher JetPrint and DuPont Cromaprint 22, had buyer advisories in the FLAAR Reports. It is also worth mentioning that most trade magazines had glowing stories praising the Cromaprint 22, indeed some had Success Stories (as did DuPont itself). In other words the FLAAR Reports was the only resource that provided adequate warning of the deficiencies; the trade magazines praised these printers.*

CONSTRUCTION (BUILD QUALITY)

162. When designed, what is the life-span that each part is tested for?

Most Chinese printers fail because they use low-bid parts. DuPont made an issue of claiming they designed their printers and that they were "contract manufactured." This was a lie in the beginning because Flora had already designed their printer in China before DuPont took it over. I never understood why DuPont wanted to take responsibility for such shoddy design and poor workmanship in those first several years (the last models were DuPont-designed, but DuPont had already pulled out before the newer models were finished).

UV printers by Infiiti are another example where cheap low-bid parts cause the printer to fall apart after a few weeks; with major parts breaking down after a few months.

In most European, some US, and most Japanese factories, low-bid parts would be recognized for what they are: a severe risk and not worth their cheap price.

The best made printers that I have seen so far are those of Gandinnovations, Spuhl, and Durst Rho.

Printers made in Taiwan are significantly better than printers made in China. Printers made in Korea are (for IP&I, Dilli, DYSS, and Lotte), are at the level of printers made in the US and mid-range printers made in Europe.

Zund engineers smiled when I asked how long their printer and XY cutter parts were made to last. They said that many of their XY cutters are still in service after a decade of steady use.

163. What kind of testing is done in the factory of the incoming parts?

Mutoh Europe had an impressive policy of testing incoming parts. Gandinnovations, Durst and Spuhl manufacturer all their major structural parts themselves in-house. Most Zund parts were made in Switzerland and you got the Swiss quality that you expected.

So one reason that FLAAR visits factories is to see and learn about these aspects: this is not something you can learn at a trade show.

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

A few printers are simply flimsy. Others are built solid (like the Gandy, Durst Rho, and Spuhl printers). One way to compare the solidness is to look at what other printers weigh. Solidness of construction can be correlated to weight. More weight in a printer tends to mean it is better built. Distinguish between dedicated flatbed printers and dual-use, since a dedicated flatbed will always tend to weigh more in order to have a full-sized table.

165. Describe the design and construction of the carriage area?

166. Describe the overall "bridge" the rail structure along which the printhead carriage travels, especially for dedicated flatbed printers that have no hood?

167. Is there a hood?
A hood protects you from most UV lamp light leak. A hood protects you, to some degree, from misting UV ink. With a hood it is easier to exhaust ozone and misting UV ink (if you attach a ventilation system to a vent opening in the top of the hood).

But since it is expensive for a printer manufacturer to add a hood, most cheaper UV printers have no hoods. An exception is ColorSpan; they sell so many UV printers, and many go to relatively family-operated companies, that not to have a hood would be too risky for possible future lawsuits.

168. Is there both a front opening for the hood and a back opening?
If there is a hood there has to be at least the front or back open. In more than 60% you can access both front and back. But in 10% or more, one side is closed.

169. The hood opening, is it strong, or cheap plastic?
Cheap printers have cheap hood openings; good printers have solid hood openings.

170. Does the hood opening have a frame?

171. Is the frame plastic or metal?

172. How would you describe the overall workmanship of visible parts? Clean (Swiss made), or flimsy and uneven (several Chinese-made printers)?
Korean printers are as clean and neatly constructed as American and European printers. Some brands of Chinese printers are getting better, such as Teckwin.

173. Does the printer wobble back and forth when printing?
Some Epson and some Canon printers (neither UV), wobble badly as they print. Most UV printers are sturdy enough not to wobble.

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

175. After you have used the printer for a while, do parts quickly wear out, break off, wobble, or malfunction?
Low-bid parts have already been discussed as a problem with printers made in China. Even when the company itself is sophisticated, if they are using cheap locally made nuts and bolts, the threads fall off, the screws disintigrate from vibration of the printer. So even if a larger part is well made, if it is held onto the chassis with a low-bid bolt or screw, or a sloppy weld by a person with no technical training and years of experience, then the Japanese or European motor will fall off the Chinese-made frame.

But American companies are not immune to this problem. ColorSpan has plenty of experience making UV printers, but the first year of their 5440uv series had issue after issue (most have now been corrected now that HP has to certify the quality). These were design and engineering issues, not so much low-bid parts (though the ink pump was not large or sturdy enough). The current HP ColorSpan printers are re-designed and do not have as many issues.

AESTHETICS

176. How would you describe the design of the printer?
Some printers are industrial (meaning with not much style). A few Chinese printers are most politely described as looking rudimentary. A few printers have a sophisticated design with style (Gandinnovations, for example).

177. Can you easily distinguish which is the "front" and which is the "back'?
I call the front the area where the LCD and operator panel(s) are situated. This usually means that the other side is where you feed the material in. I call that the back. But many printer companies call the feeding area the front. It makes no difference as long as you define what you mean in advance.

Some UV-curable printers have a moveable control computer that can be situated at one end, or at the feeding area (whichever location the operator prefers). But the standard arrangement is that the LCD and keyboard are on the output side. I call this the front.

Front | *Back*

Teckwin TeckSmart UV1600 printer at factory visit in 2007

SET-UP OF THE PRINTER: PRACTICAL CONSIDERATIONS

178. What is the delivery time, between the time I order the printer and it is delivered?
Longest waiting time for a printer is after a major trade show.

179. What are the electrical requirements of this printer? This means, will the building have to be rewired.
220 is the usual requirement for electrical needs of a UV printer. Some more industrial-sized machines, like the Gandinnovations or NUR printers, require substantial rewiring. The Luscher requires major rewiring of your building.

180. 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. Increasingly ozone production is surprised; this has led some companies to claim that "no ventilation is needed." Such a claim is dangerous, especially in a country like the US where litigation is so common. Has Agfa never heard of misted ink? Ink mist is what the printer operator could potentially breathe if the ink is misting (many printers mist, most notoriously the Infiniti 1600 models; the ColorSpan 72uvX also mists a great deal).

181. Are there any special temperature or humidity requirements or preferences of this printing system?

UV printers do not like constant changes in temperature. Static is a major headache when the humidity is too low.

182. What about altitude? Some cities such as Guatemala City are at a high altitude?

Almost no spec sheet and not even many User Manuals mention anything about altitude. But Guatemala City is about 1500 meters above sea level (which is rather high; there are four volcanoes visible out my window as I write this), and other parts of the world have even higher elevation.

183. What about dust and cleanliness of the air?

Dust in the printing environment is an aspect that is often neglected. It is crucial that if a sign shop, that no sanding, sawing, routing, sandblasting, or grinding operations be nearby. The dust and debris from sawing and comparable operations are extremely unhealthy for a UV printer.

In other words, you need to ventilate away more than ozone and ink odors; you need to ventilate away everything else that is already in the printshop environment.

184. What is the connectivity? Network, SCSI, FireWire, USB or USB 2, or other?

185. A network connection is what you expect but a few printers have proprietary connections such as ColorSpan.

186. What air pressure is required to be provided to the printer? Is this for a vacuum table, or other purposes (such as ventilation)?

Simple hybrid printers create a vacuum with a set of fans under the platen. Combo printers need a serious vacuum pump. Sometimes the pump comes with the printer; in other instances you have to buy one yourself.

187. Realistically, how much surrounding and support space will the equipment need in addition to the machine's own footprint.

You need space to store rigid materials flat, not standing on their side (they warp if not stored flat). Actually come materials come warped or warp even if stored flat. You then need space to off-load and store the printed panels. Nonetheless, I have seen UV printers in small sign shops in strip malls.

188. What space is needed to accommodate not only the printer but everything else to make the printer fit into your workflow?

189. Does the printer come in one piece? Does this mean you have to remove a wall to get the printer this size into your office?

A few printers are so large they do require industrial-sized openings to get into the building. Few of the larger UV-printers could realistically be installed on an upper floor. But a ColorSpan would be fine anywhere in most buildings.

190. What is the size and weight of the printer?

191. How many boxes arrive?

192. What comes in the box?

193. What size and kind of forklift truck do you need? Or do you need a crane?

194. Does the printer have lifting hooks on the top, or elsewhere?

195. Can you install this printer yourself?

INSTALLATION OF THE PRINTER: INSTRUCTIONS & MANUALS

196. How many manuals are available?
ColorSpan offers a helpful range of manuals. Other printers have not much more than a rudimentary User's Manual. Gandinnovations improves their printers at a rate that their manuals are usually slow to catch up.

197. Which manuals are hard-copy?
Which manuals are only on CD?
The User's Manual tends to be hard-copy. Most other manuals tend to come on a CD or DVD.

198. Is there a Site Preparation Guide?
If so, is it helpful?
The better the printer the more likely it has a Site Prep Guide. This guide is not only to help you, and to help during installation, but is so the installer does not waste his time arriving only to find out that your doors are not wide enough, your electrical system can't handle the new printer's requirements, etc.

GCC manuals hard-copy

199. What is the rating of the usefulness of the Setup Instructions?

200. What is the rating of usefulness of the User's Manual and other associated materials?
Instruction manuals vary from excellent (NUR, Oce, ColorSpan, Zund), to practically non-existent (two brands that we know of so far), to poorly translated, to average.

Most printers have three manuals or at least information, ColorSpan would be an example: site preparation, set-up, and operation. A fourth would be a detailed maintenance manual, usually available to operators who have received additional training.

201. Is there a glossary in the User's Manual?
Few manuals have glossaries.

202. Is there a Service Manual?

203. Is the Service Manual for the end-user or only for tech-support?
About half the manufacturers prefer not to provide a Service Manual to an average end-user, since an inexperienced operator can do more damage than good trying to repair something himself.

204. What is the native language of these guides? Is the translation acceptable?
This language aspect is more crucial than you might expect. Sometimes my accent in Spanish is difficult for native Spanish speakers in some countries to understand. So I can appreciate the problems with multi-language conversations. People who own printers that have to be serviced by Chinese, Japanese, or Korean speakers universally report that they do not understand fully the English spoken, due to the heavy accent. I would guess that my Japanese may have been awkward for Japanese people to understand too (I lived in Japan for six months; this is where I first learned digital photography, digital printing, and Adobe Photoshop ver. 4).

I have also heard Americans say that support for French-made products was not understandable due to the heavy French-accented English.

Politely put, if you buy a product from a country outside your own, be sure you can understand them, and that they can understand you. If you, you will have endless headaches.

205. What kind of cut-away drawings or other drawings exist that show the various parts of the printer?
I give high marks to printer manufacturers who include lots of drawings to help understand the different parts of the printers.

The best exploded views of any product in the world are those by Canon camera.

206. If there are no cut-away drawings, are their photographs of the back as well as of the front?

207. How hard, or easy, are the manuals to obtain BEFORE you buy the printer?
Some printer manufacturers hide their manuals because they don't want anyone to see them. Yet MacDermid ColorSpan offered their manuals openly on-line (on their web site). So the policy varies by manufacturer. We do a full report only on those printers where the manual is available to us.

208. Is installation included in the purchase price?
This tends to depend on the dealer and the country

209. How many people come for the installation?
Usually one person comes to install a printer and do the training, but in some instances the installer is one person and the trainer is another.

210. How many people are required to lift, move… the printer during installation? How many people do you need to provide for the installation?
Usually you need a fork-lift truck to install and move a UV printer, though once installed, most entry-level and mid-range machines can be rolled on their wheels.

211. Do people also come for a pre-installation site inspection? Or is the inspection just a form sent in by e-mail or fax by the print shop to the distributor? From the factory or from the distributor or from the dealer?
Whether a person comes from the manufacturer or dealer, or whether you do the pre-installation check-off list via e-mail depends on many factors, including whether the distributor is in the same city as you, or on a different continent.

TRAINING

212. Is training included in the purchase price? If so, what kind of training is offered?
The most important training is not merely what you are told the day the printer arrives, but the deeper training that you will only figure out that you need after you have faced your printer for a month or so.

213. Is training necessary?
Yes, training is essential for any UV printer, whether an entry-level machine or high-end. Lack of training, incomplete training, and lack/or of experience are a factor in about a third of the problems that people have with UV printers. Another third is often inadequate cleaning and maintenance of the ink and printhead system. The other third cause of problems would naturally be weak parts (that wear out before they should), wear-and-tear (happens even to the strongest parts made in Switzerland), and features that need improvement, etc).

214. Is classroom training available?
No, classroom training is not common.

215. Is factory training available?
No, factory training is rare, though some companies do welcome factory visits, and a few companies do indeed offer training at the factory.

216. What on-line training is available?
Fewer than 5% of the UV printer manufacturers offer on-line training.

217. What about follow-up training after you have had the printer a month and know enough to ask better questions?

218. 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)?

219. Realistically, what expenses must you incur for the installation, such as a fork-lift truck or crane to lift the printer off the truck?

220. What is setup of the printer like? How many people are required to be provided by the end-user to help for setup?
Usually one person comes to do setup. They may need you to provide additional people to help move the printer by hand (in addition to a fork-lift).

221. Between the day the printer arrives, how soon is it realistic to achieve full productivity?
The larger and more complex the printer is, the longer it takes to start serious production. Companies that buy the $650,000 Luscher report it can be month(s) before they fully produce with ease. Printshops that buy the $65,000 ColorSpan UV report they can produce substantial jobs by the fourth day. This is why FLAAR does site-visit case studies so we can report what it is really like to try to produce signage with each different brand of UV printer.

222. How much of a learning curve is there?

TECH SUPPORT & WARRANTY

223. What is the original warranty period?

Some printers are warrantied only for 90 days; others for 6 months. A full year is what you should expect. GRAPO offers a two year warranty.

But a warranty on paper is not much good if the manufacturer is 12,000 miles away in China and the reseller is 3,000 miles away and is not a native speaker of your language.

224. How does this warranty period compare to warranties of comparable printers?

225. Does it include parts, labor, printheads?

Most warranties exclude printheads: at up to $2,000 per printhead, this is a reality check to be aware of.

226. Is there an extended hardware warranty? What price?

You normally have to buy an extended warranty.

When we interviewed the owner of a Gandinnovations UV flatbed the same week as the interview of the Vutek owner, the Gandy owner said that one of the many things he liked was that he did not have to pay for an extended warranty. A full-warranty, perpetually, was included as long as you bought your ink from Gandy.

With other printers, an extended warranty costs between 7% and 12% of the purchase price. A well-established reliable printer will have a 7-10% warranty cost; a new printer with unproven repair costs will need to charge 11 to 12%, since they don't know what repair costs will be likely.

227. What about getting your money back if the printer is a dog?

228. What sort of serious technical assistance is actually offered? Do the tech support operators read from a script and only get a real technician later on?

Gandinnovations and ColorSpan tech support get the best marks from sign shop owners when we visit them and ask about tech support.

People who buy printers that don't sell many say that their tech support people simply don't have much experience because not enough of that brand are out there. This can be a $650,000 European printer which sells only a few due to its high price, or it can be a $55,000 Chinese printer that sells few due to known or anticipated headaches.

229. What training does my tech support person have? Is he factory trained? In what language? How many tech support people are available to cover the US (or Canada…)?

I have met about half of the Gandinnovations tech support engineers for Europe, Canada, and the US. They know their printers inside out.

Another factor is, if the printer is made in China, Taiwan, or Korea, your local support person may have never seen the factory, much less had training there.

230. For how many months is tech support offered? Is this the entire period of the warranty.
One printshop in the US that had a printer made in Switzerland did raise issues with the hours of tech support especially since European countries tend to shut down totally after 5 or 6 pm (I experienced this when I lived for three years in Zurich, 8 years in Graz (Austria), and 9 years in Germany (Halle, Essen-Werden, and then near Bonn).

231. What is wait time to speak with a support technician?

232. What are the hours of tech support? If support is from eastern time zone, hours should be at least 8 am through 8 pm to cover users on the West Coast.

233. Can support technicians talk users through how to achieve the color of a corporate logo or do you have to take an expensive course to learn ICC profiles and color management?
Color management is considered separate training that you are supposed to obtain on your own elsewhere. If you find a UV printer tech support person who will train you to do custom ICC profiles, you really have found a good tech person to stick with.

234. What happens if the tech support from your local distributor is uninspired or inadequate? Can you telephone the manufacturer directly? If so, will be manufacturer actively assist you, or only begrudgingly?
MacDermid ColorSpan was good at providing direct manufacturer's tech support. Whether this will continue under HP ownership is not yet known. Dilli also can provide manufacturer's tech support if absolutely needed. Some other manufacturers simply don't provide tech support themselves, or only begrudgingly: they expect their dealers to provide support. We have several instances in Australia of poor tech support for GRAPO printers and the printshop owner rated the backup from the manufacturer in the Czech Republic as unsatisfactory (that's putting it about as politely as I can; the situation was quite unbearable for two owners in Australia). GRAPO did not refuse support, but not enough was spontaneous to resolve the situation with the end-user.

An inadequate dealer or distributor is a good recipe for endless headaches. Choosing a distributor is as important as selecting a brand and model of printer.

235. Can the manufacturer remotely diagnose the printer?
Remote diagnosis is rare, and not available on any mid-range UV-curable inkjet printer.

236. What is the native language of the tech support person?

237. Who does repairs? Dealer, manufacturer, distributor, or third-party?

238. Do spare parts come from another country? If so, what is the wait time?
Yes, there is FedEx and DHL from China, but it does take longer.

239. How far does tech support person have to travel to reach my printer?

240. How long are spare parts maintained for discontinued printers?

CLEANING & MAINTENANCE NEEDS

241. How easy is it to access the area where you have to clean the heads?

242. How is head cleaning accomplished? purge, suction, manual, other?
Some systems purge; other systems suck with a vacuum; some wipe with blades; on others you have to wipe yourself with your hand (holding a wipe naturally and using gloves).

243. To what degree is purging automatic (once you press a button), and to what degree is it manual?

244. 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?

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

246. How often should you purge? Does the User's Manual honestly indicate how often you should purge?

247. Is purging done with ink, or with a flush solution?

248. If done with a flush solution, how do you add the flush to the printheads? With a syringe, or a manual button or toggle switch, or automatically with software command, or other method?
With most mid-range UV printers, you manually turn a valve to open the ink lines so that the flush will flow into them. In cheaper printers you have to inject the flush with a syringe by hand.

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

250. The ink that is purged, where does it go? Into a drain/waste bottle, or into a drip tray?

251. How should you handle the drip tray? How often?

252. Is there a capping station?

253. Is capping on a sponge or on a metal fitting? Do you cover the caps with cellophane, or is capping direct?

254. Is the capping station covered by a lid that must be removed? Or is there another way to access the capping station? Or is the capping station completely open with no lid?

255. Where is the service area, at the left, or at the right?

256. What is the nature of the service station?
Some service stations are easy to access; others are way underneath the printer and require getting down on the floor (Luscher). These are the little things you don't find out about until you buy the printer, though usually FLAAR mentions these issues in our site-visit case study reports or evaluation reviews.

257. Are there wipers?

258. Is there a vacuum suck cleaning system, like a traditional vacuum cleaner?

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

260. Is the service area the same as the parking area?
Sometimes the service area is at the left, sometimes at the right; sometimes the service area is at one end and the parking at the other end. This all depends on many factors of the original design considerations. There is no one rule and no one system that is inherently best.

261. Is the capping station the same as the service area or the parking area? Or separate from both?

262. Is there a dip-station that is separate from the parking or maintenance station? Is there an off-printer dip or soaking station for the printheads?
A few printer companies make off-printer cleaning systems available. You put your head into this system when it really needs serious cleaning. Of course there is a point where you have to replace the nozzle plate (which only the manufacturer can do). But most normal machines only have purging or cleaning possibilities on the printer.

263. Does this printer spit, or "weep" ("flash") ink at regular intervals?
The Raster Printers and the DuPont UV printers each spit because they are based on retrofitted solvent ink printers manufactured by Flora in China. Most other UV-cured inkjet printers do not spit, in part because UV inks supposedly don't need to spit. But UV inks clog more than they are supposed to.

264. Do you need to have a band of printable colors along the edge, outside the main printed area, to keep all printheads and their colored inks fresh and ready to print (so as not to dry out when not be used by the colors in the design)?

265. Do you have to manually open and close a valve to let the flush solution flow through a printhead? Is it individual for each printhead? Or is it automatic from the LCD touch-screen or keyboard?

266. Does the manufacturer provide any special cleaning tools?

267. Does the manufacturer provide any special cleaning liquids?

MAINTENANCE

268. What daily procedure is required at start up in the morning?

The spec sheet does not provide any info on maintenance; you need to see the Operator's Manual. This is why we try to get our hands on the Operator's Manuals for as many printers as possible. This is why some manufacturers prefer that we don't have access to their manuals (we will see how complex some aspects are).

Fortunately ColorSpan, Gerber, Oce and other manuals can be readily found; Gandinnovations, NUR and other companies have been considerate in sending theirs.

269. What daily maintenance is required at night?

Some printers have automatic shut-down; you just walk away and the printer turns itself off. More complex printers require a shut-down routine including flushing or other preparations for not being used overnight.

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

Most well-built UV printers work best if kept running all day. Unless the parts are weak; in that case the printer falls apart, screws work their way out, and parts fall off. This is what we learn when we visit printshops. Don't worry, 95% of the printer brands hold up okay or well. But 5% simply can't hold up to constant use. FLAAR Reports identify which is which, especially in the site-visit case studies

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

Your User Manual should list periodic maintenance such as changing ink filters. ColorSpan has a clever new feature: each new ink bottle comes with a fresh filter already installed; so you don't have to worry about forgetting to change the ink filter.

272. How often do filters have to be checked? Cleaned? Changed?

273. How expensive is replacement of the filters?

274. What would be a "maintenance check list?"

Keeping the printer clean inside is crucial; maintaining the heads is important.

275. How do you clean the transport belt?

276. How often do you need to clean the transport belt?

277. What part(s) of this printer need the most attention to avoid breakdown?

278. What parts of this printer simply wear out or tend to break down the most often?

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

If your system has issues with misting of the ink then you will need to clean everything inside the printer more often.

Durst Rho 351 UV lamp, being cleaned

280. What self-maintenance does the printer do on its own?

The more expensive printers look after some aspects of their own maintenance and operation. The really cheap printers don't. But the good economy printers do self-maintenance because they assume the operator will prefer the printer to take care of itself. You learn which is which in the individual FLAAR Reports (there are over 60 models of printers so we can't list the peculiarities of each in this FAQ format).

281. What maintenance issues should be noted?

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

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

284. If you change ink, how much hands-on work is required to set up the ink system? Is hand priming or sucking the ink down the tubes required of the operator? Is head priming automatic, or operator initiated?

The Zund 215 has a relatively complex system, requiring considerable dexterity with a syringe. But their operator's manual describes the entire procedure in exquisite detail, including many large almost full-page drawings.

285. How much time, media, and ink are used during regular cleaning, calibration, and maintenance?

Get used to wasting lots of inks and materials. Most clever printer operators have learned some work-arounds to reduce the wastage.

286. 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?

Some machines need to be on all the time (Sleep Mode is considered on). A few printers you can turn off completely.

287. How long can the printer sit unused?

If idle for more than several days, it is recommended to flush ink from print heads completely and replace with print head flush solution. Actually it is best to use your UV printer every day. If you are not going to use it every day, fill the system with flush solution and cap the heads (please note: this procedure varies considerably from one printer to another; some have no capping station; others you have to inject flush with a syringe).

Check with an experienced tech support person, but merely turning your UV printer on for a test print every few days is NOT what is meant by using your printer every day. It may be better to fill it with flush and not use it at all. But this depends on the plumbing system of your specific printer, so check with tech support: we are not a medical doctor for specific individual printing problems; just trying to get the message out: UV (and solvent) printers are designed to print; not to sit unused.

288. How should a printer be prepared for sitting unused for a long time?

Solvent printers need to be used every day. Otherwise the ink dries in the nozzles and nozzle plate of the printheads. It was an early mantra that UV ink escaped all the problems of solvent printers: that you never had to weep (spit at the end of every pass); that you never had to purge; etc.

But in reality UV-curable ink has comparable issues, plus the added problem of curing inside the nozzles. Cationic ink can cure spontaneously (once initiated) all the way back into the ink tubes. Fortunately most printers don't use cationic ink; they use free-radical curing chemistry.

But reflected light can cure the ink inside the nozzles; heat can cause gellation which can clog the heads. So in some printers the heads are capped at night; in some printers you have to fill the ink lines with flush if you don't print frequently. Indeed a UV printer is intended to be used every day. We just received an e-mail from an end-user whose printer had endless issues. He said they used it seldom because of other issues. My first question was whether the infrequent use was a cause of at least some of the issues.

SAFETY & HEALTH CONCERNS

289. How is safety treated in the printed literature?

GCC's StellarJet 250 UV manuals have among the best treatment of safety aspects; in other words, they tell you point blank some of the reality of UV ink and UV lamps. If the warnings do not make you cringe, they are not realistic.

290. Who sets safety parameters, the machine or the operator?

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

The expected number of emergency buttons is four. The traditional locations are two on the front; two on the back.

292. Have you employed an emergency stop yet?

293. Is there auto-shut down? If so, what triggers it?

The machine should have an interlock on the hood; the printer should automatically shut down if someone opens the hood. Of course some printers have no hood!

Otherwise, the printer should shut down if the lamps overheat.

Emergency stop button. Oce Arizona 250GT UV

294. Is there auto-shut down if the operator sticks their hand into the system while it's operating?

With some early printers you could get your hand in; increasingly the printers are becoming safer.

295. How much odor is emitted by the photoinitiators or other aspects of the UV-ink or curing process? How much subsequent outgassing is there, and for how long does the stuff smell?

UV-lamps produce considerable heat. This is the first thing that needs to be vented.
UV chemical curing processes produce considerable odor as an inherent aspect of their curing. UV-ink is not always cured instantly (that is the ideal goal but not the actual result in real life). Outgassing means there are additional odors after printing is through.

296. How much ozone is produced?

Ozone can cause some Epson prints to deteriorate; I would estimate that some other inks may also deteriorate faster if exposed to ozone. So far there is no ozone chart available because most manufacturers claim "our printer produces insignificant ozone." I think Zund and Mimaki are the most honest in respects such as this.

297. Is there any ozone suppression system inside the printer?

298. Will this amount of ozone cause deterioration of other inkjet prints being produced elsewhere in my print shop?

299. Should VOCs (Volatile Organic Compounds) be of concern?

300. Is the machine enclosed, or exposed?
The ColorSpan, Gandinnovations, and Zund are "exposed" systems. Almost all other inkjet printers are enclosed by a hood.

301. 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.

Gandinnovations 3150 UV, an example of exposed system. ISA 08.

302. What keeps UV lamp light from leaving from the space between the bottom of the hood and the platen or transport belt?

303. What kind of "skirt" exists along the bottom of the hood to prevent light leakage?

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

305. 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?
Note that even trade magazines comment, "Venting—Flatbeds, both solvent and UV-curable, may require the addition of equipment for venting fumes, odors, and particulates." (Nov/Dec 2004, p. 38, The BIGPICTURE Magazine).

306. What is the noise level, primarily of the fans for the vacuum?

307. Do the printer specs list the noise level?

308. What moving parts might hit a person if they are standing near the printer?

309. Are any other safety or health issues involved? Does the operator need to be concerned with any other safety precautions?

"UV light does not turn corners… I wear UV glasses when wiping the heads and to keep ink out of my eyes."

Industry specialists ask out loud about two health issues that have not been addressed so far: damage to the retina from the UV light not being fully shielded, and unknown problems with the chemicals that are outgassing or otherwise being emitted. Other industry specialists ask about the effects of the free radicals in the photo-initiators.

Most UV printers are "enclosed" to one degree or another. Some models of the L&P Virtu (Spühl in Europe), are almost sealed (in roll-to-roll mode; in flatbed mode there has to be an opening at the back for the material to go in and an opening at the front for the thick rigid material to come out.

Among the high-end models, the Gandinnovations JETIi UV is the only one without an enclosure around the area traversed by the printhead carriage. At entry level the Zund 215-series and ColorSpan UV printers are all open. The Raster Printer models are enclosed.

Relative to other safety or health issues we recommend keeping track of industry publications and asking other people who use, or are considering to use, UV-lamp printers. Helpful information is available from various issues of the RADTECH Report, from at least 1999 onwards.

Industry specialists ask out loud about two health issues that have not been addressed so far: damage to the retina from the UV light not being fully shielded, and unknown problems with the chemicals that are outgassing or otherwise being emitted.

UV-cured inkjet printing is too new to allow recognizing all the safety or health issues involved. But misting (vaporization of the ink inside the machine) is dangerous since you can inhale this mist.

Other safety issues are pinch points (where your fingers would be pinched), where you might get cut or otherwise hurt, hot UV lamps, and a host of other sources of injury. Most conscientious User Manuals list typical hazards.

310. Is the Operator Manual so poorly translated that you might make a mistake; a mistake that could be damaging to your health, or otherwise dangerous for your printshop?

Inadequate, incomplete, or incomprehensible sentences are most common with Chinese manuals, but instances could be found with some Korean and even some Japanese manuals. Even manuals translated from European languages have a few phrases which vary from the humorous to overly literal to occasionally confusing.

311. 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.

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

I would estimate that damage to your eyes is a realistic hazard.

313. How do users know if they are allergic to the non-cured ink?

PRINTHEAD TECHNOLOGY

314. Which brand printhead is used?

Most UV printers made in the US, Japan, and Europe use Spectra, Ricoh, or KonicaMinolta heads. VUTEk is one of the few that uses Seiko printheads. It is reported that one downside of Seiko heads is that they must spit (which waste expensive ink). Most Rho printers do not have to spit except for white ink.

315. Which model of printhead is used ?

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

317. Is this a printhead adapted from solvent ink or a new design made especially for UV ink chemistry?

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

Both Xaar and Spectra are piezo electric printheads. These are industrial strength piezo printheads, as compared to Epson piezo printheads which are more for home and hobby printers.

Durst started out with Xaar heads and then switched to Spectra.

Mutoh used to use Xaar printheads and then switched to Spectra.

Need we say more. But Xaar heads do improve with quality with every new generation and some features of Xaar heads may be preferred for certain applications. FLAAR now has a separate report on printheads specifically for UV-cured ink.

319. How many nozzles per printhead?

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

ColorSpan is one of the few printers at entry level with this level of sophistication. I believe the Gandy printers can accomplish this also.

321. How many printheads per color?

Two printheads per color when you have the dual CMYK version.

322. How many total number of printheads?

323. What is the position of the white printheads relative to the rest?

You really need two printheads for white; one printhead can't deliver enough white ink to make the ink opaque enough to use. And you also need two printheads so that you can lay down white ink before, or after, all the other colors (so you really need four printheads, since white requires two heads worth to make it opaque in each direction or sequence or printing).
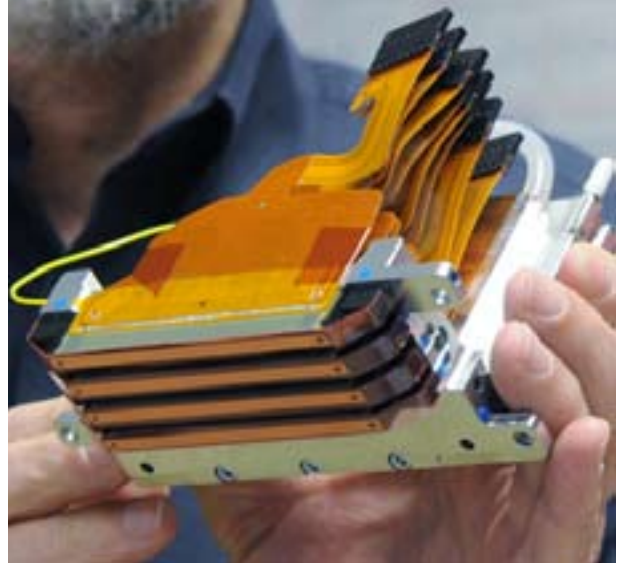
Chinese manufacturers have learned that if they advertise advanced features: such as having Spectra heads instead of merely Xaar heads, that sign shop owners will buy these machines assuming that everything in the printer is at the standard of a Spectra head. So now Chinese manufactures are listing white ink as an option (but the sign shop owner does not realize that one or two heads is not enough). This is why it helps to have the FLAAR Reports.

324. 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?

325. Is the printhead for the white ink the same model as the printhead for the other colors?
DuPont stipulates that Flora use a larger drop size printhead for white since to make white opaque you need more ink. So the regular six colors have one picoliter size, and the white ink heads jet a larger picoliter size.

PRINTHEAD DPI & Features

326. What is the drop size in picoliters?
IP&I has a picoliter drop size of about 14. The Agfa UV printer has a drop size of 75 pL. The ColorSpan has a droplet size of about 25. So it is important to learn the drop size. Most spec sheets don't admit the drop size, so FLAAR does its best to learn what the drop size is of each printer, and we include this in our report on every brand and each model.

327. Is there variable droplet capability?
It is not expected to have variable sized droplets in UV printers.

328. What is the nozzle spacing?

329. What is the dpi of the encoder strip?

330. 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?
Lots of mumbo-jumbo is used to obscure the true dpi. One of the few honest specs is by Zund, but in their Operations Manual, not in the spec sheet you see before you buy the printer. Zund states clearly their dpi is really just 180 and that it takes multiple passes to achieve 360. They do not claim (at least not in their user manual) any fictitious dpi count.

331. What is the true dpi of this printhead? If the spec sheet uses the concept of "perceived dpi" or "apparent dpi" how they calculate perceived dpi instead of true dpi?

332. How many passes can this printer achieve?
One pass is junk mode (called draft mode, but the output is usually not good enough to sell, except to clients that don't care about quality).
Two-pass mode is usually the bare minimum.

Four-pass mode is generally acceptable.

Some printers go to 6 and 8 passes (Roland offers up to 32 passes on its waterbased printers but it is very very slow at this quality).

Some printer software does not really want to remind you how many or how few passes are involved, so they use jargon like "production mode" or "high quality mode." It is not the end of the world if you don't know how many passes are involved. Just realize that the better the quality the slower the output is.

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

FLAAR prefers to use consistent terms that are standardized for all printers so that printshop owners, managers and printer operators have a fair chance of comparing speed vs quality. By not identifying the actual passes, or by defining pass in an atypical manner, this results, in effect, in hiding the reality of speed vs quality. Thus we commend those companies that keep to, or return to, the traditional usage of the term pass(es).

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 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.

334. If modes, what are the modes called?

335. Are the passes identified for the modes?

336. At trade shows, how many passes is the printer operating at to show the results?

337. What are they doing at a trade show booth to make the output especially attractive? Are they doing things that would slow down the workflow in a real-world printshop?

338. Are trade show images done at uni-directional or bi-directional mode?

Some Mimaki and all Inca printers are uni-directional only. Uni-directional printing offers the highest quality but the slowest print speeds.

339. How does the resolution of this printer compare with other brands or other models of the same brand?

340. Is nozzle compensation available?
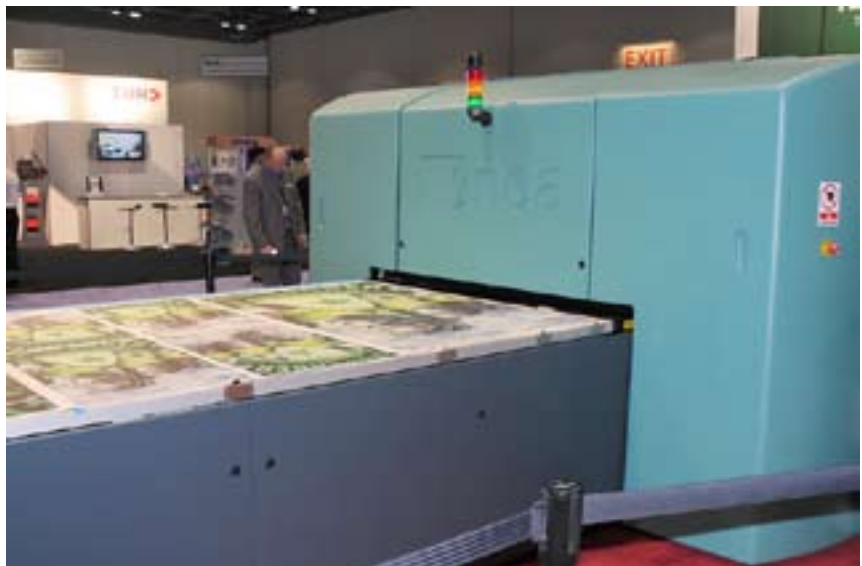
Inca columbia Turbo Plus printing on flat rigid substrate at ISA 08

Bi-DIRECTIONAL VS Uni-DIRECTIONAL PRINTING

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

342. 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).
As with most other printers, sequence of colors in one direction of the carriage is one way; sequence when printing in the other direction is different. You need to have two printheads per color, and have those printheads arranged in mirror order: CMYKKYMC, for example, to get the color sequence the same when printing in the backwards direction. But merely having two printheads is not enough; they have to be physically arranged in mirror order.

343. Does the ink angle in one direction, or the other, or in two directions? In other words, is there any pattern in the ink dot shape on the substrate depending on which direction it is jetted from?

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

345. Is there a left-right alignment compensation procedure?

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

347. Which materials can be printed at bi-directional setting?
This decision is usually up to the operator or client.

348. Which materials have to be printed at multiple passes?
This decision is usually up to the operator or client.

349. Which materials can be printed fast at 2-pass or 4-pass modes?
This decision is usually up to the operator or client.

PRINTHEAD Positioning

350. What is the position of the printheads relative to the media? Above, jetting down (the common position) or alongside, jetting horizontally (rare)?
Most printheads are above the media so the ink is jetted downwards. In rare designs the printheads are elsewhere relative to the media.

When printheads are above the media, they can be placed either diagonally to the media or parallel to the media.

351. Are the printheads at an angle to the movement of the carriage, or at 90-degrees?

352. Are the printheads in a straight row, or staggered?
The normal position for printheads is parallel to each other in a row. But there are exceptions, and staggered the positions may have other benefits. Each pattern for positioning the printheads has a reason, but most printheads are simply parallel to each other in one row.

353. Do you raise the heads manually, with click stops, or motorized?
There are countless different ways to raise and set the heads. Often it is done manually. You use a shim; lower to the height of the shim. More costly printers do this automatically.

354. How complex is the procedure to align the printheads?
Complexity with printheads can vary especially because a simple printer will have 4 to 8 heads; the newer production printers will have 48 heads.

355. Is there an alarm system to stop the head from hitting substrate if head is not high enough?
A head crash into something substantially too thick would tend to break the lamps before the surface of the printhead could get on top of the material. Evidently the machine itself will not detect if a material is too thick. The operator must know and either set the printer manually or stop it (I guess by pressing a STOP emergency button?).

The Mimaki JV5 (a solvent printer, not UV) has one of the easiest crash-avoidance systems. I am surprised that other manufacturers have not noticed this and copied it.

356. Can you vary the gap (the distance from the printhead to the media, which is the distance the ink droplets must fly?
The more sophisticated the printer the more likely you can vary the gap.

357. How is the nozzle plate protected? Is it recessed?

PRINTHEAD: Associated Features

358. Is ink heated in a buffer or elsewhere before arriving near the printhead?

359. Is there a heater associated with each printhead?

360. Or is the entire plate heated and thereby some heat gets to the heads?
Heating the metal plate that holds the nozzle-plate area of the printheads as a group (the base of the printhead carriage so to speak) is a cheap way that early Chinese printers did their heating. I don't know of any serious UV-curable inkjet printer manufacturer outside China that uses a heated plate to heat their ink (but with 45 manufacturers, there are always surprises).

361. Does any other part of the printer have heat, such as the platen?

362. What is the firing frequency (voltage) of the printheads (in KHz)?

363. Can the firing frequency be varied by the end-user?

364. What is the effect of changing the firing frequency of the heads?

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

Yes, negative pressure is used, as with most UV-cured inkjet printers. Most of the machine gets turned off, but the head still has negative pressure. If the entire machine goes off due to electrical failure, you lose only the ink from the buffer. So it is recommended to have a UPS unit for the overall machine.

366. Is the negative pressure user variable?

367. Are there problems of air getting into the system?

368. How is air eliminated from the ink lines or from the printheads?

369. Since most UV-curable ink printers are still being upgraded and improved as experience accumulates, what are the chances that this brand of printer will have new, different, or revised heads in the next year? If such new heads come out, are you stuck with the old ones?

This is a matter of luck; Vutek switched from Spectra to Seiko heads. The early Inca switched from Xaar to Spectra heads. You generally are stuck with the heads that your printer came with originally. Heads developed since 2006 are generally quite sophisticated but some of the heads are so new they don't yet have a track record. Spectra heads made since 2005 and Ricoh heads of that era seem to be the most stable (over 900 ColorSpan UV printers sold have Ricoh heads without serious issues). There are hundreds of printers with Spectra heads that have no congenital issues either. Not enough printers have Konica or Seiko heads to know how they hold up. Xaar heads, in the past, have had serious issues, but some companies, such as GRAPO, use these heads without major issues. But other than GRAPO and Zund, all European, American, and Japanese manufacturers have abandoned Xaar heads (ToshibaTec, Konica, and Seiko heads use patents licensed from Xaar but these three heads are not manufactured by Xaar).

370. Do you need to tell the printer where to start printing?

With most printers under a quarter of a million dollars you need to tell the printer where the sheet is. But increasingly the printers have sensors to help them locate where the material is so they know where to start (and stop) printing.

PRINTHEAD Life Expectancy

371. What is true life expectancy of this print head? Is the printhead considered a consumable?

Xaar printheads get consumed the fastest. Spectra and Ricoh printheads probably last the longest. Other printhead brands are in between.

372. How many nozzles have to be out before the manufacturer will replace the head under warranty?

373. If this piezo head fails, who is responsible for paying for replacement heads?

374. Is there a limit to the number of printhead failures that are covered over a unit of limited time?

375. How often can you expect head strikes? What causes them? Who will replace the printheads and at whose cost?

Head strikes is the most common cause of premature head failure (another cause is constant flushing; the flushing seemingly wears out the nozzle system). A single head strike may wipe out only a few nozzles, or may kill the entire printhead. Head strikes may be occasioned by a diverse variety of situations:

Improper loading of the media, which make cause buckling, because the media is caught, or not going through the printer properly.

Thin media can curl, thereby causing a head strike on the curled part
Edge guards, which work on paper, canvas, and other thin materials, are not intended for thick material such as fome-cor.

If media is absorbent, too much ink can make the material bubble up

If media is curled or bubbled by heat; the head can hit the raised part

If media is defective to begin with, or uneven, the head can hit the raised part

If you have cut the material, such as Fome-Cor, the raised edge can cause a head strike.

If adhesive pulls off the material (such as Controltak), the adhesive may get stuck on the nozzle plate of the head.

Some material is like sandpaper to the nozzle plate, some papers, and metal (and the metal edge is another danger to the printhead nozzle plate).

376. How can head strikes be avoided?

377. What else, besides a head strike, can cause a head to fail prematurely?
Dried ink in or on the nozzle plate can cause printhead problems. If you neglect to purge and wipe in the morning you may have printhead nozzle issues. If dirt or fibers (especially from printing on textiles) get up into the nozzles, this too can cause problems with the printhead performance.

The head can be shorted out (electrical short). Or the printhead heater can fail.

378. What are the most common causes of printhead failure?

379. Which of these causes of failure are covered by the warranty? Which causes of printhead failure are not covered by the warranty?

380. What does each printhead cost to replace?
Static can cause a head to short out and thereby to fail. An electronics failure and severe head clogging can also cause a printhead to cease working properly.

381. Distinguish price for the printhead and also price for the service technician to come and do the installation if it is not user-replaceable?

382. Is the printhead user installable?

SUBSTRATES

383. Can this printer handle printer rigid material only, or roll-to-roll only, or both interchangeably?

Coroplast is one of the most common rigid substrate to print in flat printers

Here is Dr Hellmuth inspecting the roll-fed substrates, in Graphics site visit.

384. What sizes of material can be printed on?

385. What is the difference between media width and actual print width?

We have this entry because some printers are called "3.2" because they accept substrates that are 3.2 wide, but the printer can actually print only 3.1 meters. In such a case the model name is misleading (and incorrect in a sense). I have even seen some model designations claiming 3.3 when they only hold media 3.2 meters. So there is a bit of misleading advertising out there.

	Print width	Material width	Claimed by how the model is named

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

Since most UV printers have overspray, if you try to do edge-to-edge printing you will get UV ink solidified on your platen. So you need to cover your platen with something, or get used to a decorated platen. Trouble is that the ink can build up and then material will no longer be flat. Again, these are aspects that no spec sheet warns you about and no Success Story in any trade magazine mentions these aspects of reality.

387. Can you adjust the rate of media feed?

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.

388. Can you adjust carriage speed?

LOADING MEDIA

389. If roll-to-roll, what core diameter(s) will this printer accept?
Virtually all UV printers have a straightforward media path, and this depends on whether the machine is dedicated, hybrid, or combo.

390. How about maximum roll diameter or weight?

391. What about minimum size that can either be loaded or handled by the system?

392. What thickness can this printer handle?
This dimension is always in the basic spec sheet and varies from an average of 1 inch to two inches. A few can handle thicker material. Less than one inch is not enough to handle non-signage materials such as architectural materials or for interior decoration.

393. Can you measure the height of the material with a sensor, or is it manual?
What you really want to measure is the printhead gap height: the space (gap) between the top of the material and the nozzle plate
(the "printhead").

394. Is roll-fed media loaded from the rear, top, or front?
I was surprised to learn that to handle roll-fed media on the Vutek 200 was an extra cost ($20,000 if I remember it correctly). Of course you can look at this as a positive feature if you only need a flatbed system (you save $20,000). But if you only need a flatbed system, why buy a combo design? A true dedicated flatbed system, such as Inca, Gandinnovations or the new Mimaki or new Grapo Manta can handle flat material with no feeding issues, no alignment headaches, and no skew.

The GCC 183UV printer has the most unexpected extra-costs of any UV printer that I know: they charge extra both for the flatbed tables and also for roll-fed media. In other words, the model 183 printer, by itself, can't accept any media; neither flat nor roll-fed, until you pay extra. That does not sound like an intelligent pricing policy.

395. If you have to load a really long roll, are their clamps or any other system to allow you to secure the first portion so the first portion won't undo itself while you are several meters away trying to load the other end?

The Durst Rho 351R has clamps so if only one person is available to load a long roll, he can clamp down the first portions that he feeds up and over into the platen area while he is still working on the other end of the roll to get that up and into the roll-feeding system.

396. What is the media path?

397. Can you manually sheet-feed media? Does it feed easily?

Hybrid and combo machines accept manual sheet feed; this is what they are actually supposed to do best.

398. Can the hardware or software handle damaged rolls? Is there a system to accommodate problem media, such as with wrinkles?

SUBSTRATES, Issues

399. What materials does the manufacturer list?

400. What materials can this printer print on perfectly?

401. What materials can this printer print on okay?

It helps if the material is clean, homogeneous surface, and should all be the same thickness.

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

It helps if the material is clean, homogeneous   surface, and should all be the same thickness.

403. What materials can this printer not print on at all?

For many materials there may be issues but you simply need to be aware of them in advance and vary the temperature and speed to accommodate the material.

About half the common signage materials have issues, but there are workarounds for most of the issues. This is because these signage materials were never originally intended to be run through an inkjet printer.

404. What materials do you use the most often, and why?

You need an unusually honest sales rep (they do exist, but are rare) to explain what materials the printer can do well, and what the machine can't handle.

405. Can you print on mirrors?

Mirrors and other reflective materials should not be attempted because they can shine the UV light back up inside the nozzles. If that happens, ink would solidify up in the nozzles, rendering the printhead inoperable.

406. What exotic or atypical materials can you print on?

Leather, foam, and a host of other materials. We have entire FLAAR Reports on materials for UV printers.

407. What feeding issues are there with some materials?

408. 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 discolor from the heat?
Yes, materials that swell as a result of heat may be problematical. The distorted material may cause a head crash. 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).

But a few of the more innovative UV printers uses "blue mirror" heat-reducing IR reflectors that absorb other spectrums of energy.

It also helps to have a multi-zone vacuum system to hold thin materials down so it does not overly distort from the heat of the UV lamps.

DuPont, and possibly Durst, may now be using blue mirror reflectors. German trade magazines such as SIP are beginning to write about this novel technology. This technology was developed in Germany.

409. 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 supposed 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).

Most printer reps suggest this is more an environmental issue than a printer or ink issue. They say you can't have carpet and you must maintain a high humidity. They admit that the static electricity situation varies depending on each site's situation.

Nonetheless, some UV printers already have anti-static systems carefully built into their printers. When these work it documents that the investment is well spent. However if the low price of your printer is in part because there is no on-board static system, and if you indeed have a static issue, the natural question is why, since this is such a well-known issue, did your brand not have an anti-static system or if so, why does it not work satisfactorily.

410. To what degree do the pinch rollers cause a static charge on the materials being printed?

411. What about wheel marks or feeding roller path marks?
Make sure that the take-up rollers do not pick up uncured ink and transfer this ink to the next print.

412. 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

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

The answer is, yes, cleaning is essential on some materials. This slows down production. On a large printer, such as a Luescher, you may need two people to brush off the large areas that this printer is capable of printing on.

So, it is essential to control static while you are wiping a sheet. Use 150% alcohol with 50% water to wipe down the materials (don't wipe with a dry cloth which could cause more static). Be careful the cleaning liquid does not soak into the material and cause problems when heated during printing.

414. What liquid cleaning material should you use to clean your materials? Which kind of cleaner, and which kind of materials per cleaner?

415. Do you use lacquer cleaner or anything besides ISP alcohol?

416. How often is pre-treatment required, either receptor coating or other special surface treatment to the material to be printed?

Pre-treatment may be needed on polyolefin materials such as PE and PP (Saunders 2004:40).

417. Which substrates must be or ought to be prepared before printing by being corona treated? Corona treatment is to improve surface tension to promote adhesion.

Corona treatment is still preferable for some materials, but the newer generation of inks are more forgiving (don't require pre-treatment of the substrates).

We worked with a company in Hong Kong and learned that some materials needed to be corona treated before you should print on them with UV-cured ink. Their initial samples were printed with a Vutek. The ink cracked and peeled on artificial leather. This company hired FLAAR as a consultant, corona treated the material, used a Durst Rho 160 instead of a Vutek, and got noticeably improved results.

When we visited a print shop that had a Vutek, they were corona treating Coroplast. So when a sales rep says "no treatment needed" that may be because the sales rep is not himself doing any printing. 90% of the booth managers and sales reps say no pre-treatment is needed. Yet I would not be surprised if over 50% of end-users disagreed and found, from experience, that some pre-treatment is needed.

418. What about flame treatment?

419. 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

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

Realize that all statements must be judged based on how long the ink has been on the material, and the surface nature of the material. Not all fluted plastic material is the same; and six months later the adhesion could theoretically be different (based on conditions of display and the nature of the surface of the material).

Adhesion may be difficult on polypropylene and Lexan. Some UV ink does not work well on Coroplast, or prints well but begins to fall off after several months.

421. Is feeding the substrate manual or automatic?

Durst has an auto-feeder at the back and an auto-loader at the front. Now some of the competition are developing similar systems, but the competitors do not yet show their auto-feeding systems at trade shows (take up too much space; uses up too much material). Otherwise, most feeding is manual. For a large flatbed size such as the Luescher, you may need two people, or the operator may need to walk up on the flatbed to place smaller objects in the center. This is a problem with the really large flatbed concept.

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

Skew can be a major issue, not so much with the material spontaneously skewing, but rather with the printer not having an adequate alignment system to begin with. So the board is skewed going into the printer.

423. What other problems in feeding exist? For heavy material? For light material?

Just realize that no transport belt on any combo-style design can feed all materials with the same precision. Some materials will go through okay; others will skip or stutter, and some may skew. This also happens on expensive VUTEk 200/600 transport belts.

And what feeds well during a test may react differently when you are in full production day after day (when the belt gets worn, and a bit out of kilter).

The worst cases of skew that we have heard of are from the GRAPO Octopus and from the DuPont Cromaprint 22uv.

424. Is off-loading of the material manual or automatic?

425. How well can this machine handle warped substrates? Obviously you don't deliberately use warped material, but out of a shipment, at least a few sheets end up with some warp anyway. On the subject of substrates, you will also have to ask your supplier of printing material: "Can substrate suppliers guarantee their material is all the same identical thickness and surface consistency? If not, the print quality will vary depending on how close each sheet is to the expected specifications.

All inkjet printers have potential problems with headstrikes from the printheads striking the raised part of a warped material. A headstrike damages the nozzle plate of the printhead and can cause premature head failure (it can cost several thousand dollars to repair or replace a printhead). A headstrike also scrapes the substrate, ruining it. So you have to throw away that print. This gets expensive if the damage is on a 4 x 8 foot sheet or thick rigid signage material that can cost $20 to $40.

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

This is something no one else really tells you about. The materials you are going to print on should be at the same temperature and humidity as the area where the printing will take place.

WHAT IS THE INTENDED MARKET FOR THIS PRINTER?

427. What is the market that the manufacturer has designed this printer for?

The Aellora UV printers and most Mimaki UV printers are made for specialized niche markets, but otherwise, 90% of the UV printers are for general signage.

428. Are other markets buying this printer that were unexpected?

Many printers end up printing applications that the manufacturer did not think of. In other words, innovative shop owners and operators can make a profit if they are clever.

429. What markets that printshops aim for might be prospective buyers of prints from this printer?

430. What kinds of companies have bought this printer models in the last two years?

Print manufacturers have two ploys to try to impress you with their sales. In both cases the information could be judged as deliberately misleading.

A ploy used by Kodak for their ill-fated 5260 was to "count' as sales, when they shipped a printer to a dealer to use as a demo model. Most companies use this ploy still today.

Another accounting trick is to say "400 franchises of Kwik Kopy have received preferential pricing." The intended implication is to suggest that all 400 outlets of this franchise have actually bought the printer. In reality, all major manufacturers grant minor discounts to franchise owners. But most intelligent individual franchise owners do independent studies before they buy. This is because the official recommendation of a franchise owner may not be a good choice: for example, one franchise recommended the Encad NovaJet 850 for a flatbed printer. We spoke with one person that made the mistake of buying what was recommended without doing his own independent checking. I paraphrase: "It was an awful printer, your worst nightmare." Of course other owners may have been able to tame this Encad, and we do know people who actually make them work and print acceptably. But these are not easy printers to use and other options would tend to be preferable in many cases.

So do not be influenced as to whether Kwik Kopy is on your preferred buyer price list, but rather, how many of Kwik Kopy's x-hundred outlets actually bought this printers in the last two years? Of these, how many were of the model that we are interested in? And did this printer do well? Or did it turn out to be the wrong choice?

APPLICATIONS

431. Does the manufacturer address the overall workflow, or do they just try to sell you the printer and then sort of abandon you?

In most cases the manufacturer is selling a machine and ink. It is up to you to learn to handle the overall workflow. But some manufacturers, distributors, and dealers will assist you with workflow aspects.

432. What are the applications listed by the manufacturer?

Most manufacturers list the standard applications such as POP, trade show displays, etc.

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

Some UV printers have excellent quality; most others are for signage only; not for fine art prints.

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

Yes, you can "print on anything" but you have to learn how to handle everything.

435. What other kinds of applications can you print?

Once you have your printer, if you are innovative, you will begin printing on all kinds of unique applications. However most printshops specialize in standard signage applications of one kind or another.

You can print fine art photos, giclee or decor with some UV printers

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

Here is where you learn the painful truth about the over-enthusiastic claim "you can print on anything and everything." Most manufacturers are honest enough to warn you that most UV ink can't go around rivets or sharp corners without breaking (though new inks are changing this). So 80% of the UV printers up through 2006 were not recommended for printing vehicle wrap. But for 2007 onward, especially with new inks, vehicle wrap is becoming more realistic.

437. To print backlit can you set a mode for double-density?

438. Is there a system for assisting double-sided backlit printing?

INK

439. Is there a special ink for flexible material, and another ink for rigid material? What other ink sets are available? Is there any choice in inks?
We discuss UV inks in pertinent publications.

440. 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. For some other printers you can buy after-market heat-formable inks.

441. If there are two inks, how difficult is the changeover from one ink to the other?

442. How many colors are used to produce output - four, six, or eight?

443. Other than white, how many spot colors are available? What about metallic colors?
Spot colors are offered by Durst and a few other companies, but it's expensive to change from one spot color to another so they are seldom used. But if your clients require a particular color, and you print enough for that client to dedicate a machine to them, then you need spot colors.

444. What is shelf life of the ink (CMYK)?
Shelf life is usually listed as 6 months. Often it is as much as one year.

445. Does the white ink have a shorter shelf life?

446. What company makes the inks? Choices include DuPont, Jetrion (now InkWare/VUTEk), Hexion, Sericol, Sun, Triangle, KonicaMinolta, Toyo, Tetenal and several others.

When the spec sheet does not identify the source of the ink, and when this is a sensitive question the manufacturer's booth personnel prefer not to answer. So in many cases we have to use common sense to estimate the most likely source of the ink.

447. Does the printer manufacturer have its own ink chemists on staff?

Durst, Gandinnovations, HP and comparable large printer manufacturers have their own ink chemists (even when they don't necessarily manufacture their own ink).

448. How often do ink formulas change? What are the implications for color management?

Ink companies change their ink recipes from time to time. So you occasionally have to redo your ICC color profiles.

Sometimes the recipe is changed inadvertently, such as one batch of Seiko ink a few years ago. Excess humidity reportedly caused one or more batches to have serious problems with light cyan and light magenta. We found this out by listening to end users who were stuck with this ink when it was sent to Latin America.

449. Where are the printer's ink containers located? Front, back, or sides?

INK: White & Varnish

450. Is white ink available?

There is a different between white ink being available and white ink that works flawlessly. Most white ink is not yet opaque enough.

451. To use white ink does that require not using light colors in order to make space for the white ink?

Realize that white is a spot color, and can't simply be treated as "just another color.

Sample print with white ink by GCC StrllarJet 250UV

452. What is the sequence of printing the white ink? Can you print all white and then print colors on top?

453. How many ink lines or printheads are dedicated to white ink? One or two?

454. Is the white ink opaque enough?

The following is a general statement and is not directed at any specific company, but is based on inspecting printshops that have white ink installed. The majority of printshops with white ink installed report that white ink has innumerable issues and is not as realistic to use in your printshop as it is portrayed in a trade show booth or a printer manufacturer demo room. I would not be convinced of the white ink of any company: whether European, US, or Japanese, until I have visited a print shop where it was functioning flawlessly over a several month period.

455. What is the shelf life?

456. Does the white ink need special attention? (Titanium dioxide may settle out if it sits too long). What company provides the white ink?

More and more printers offer white ink, but fewer and fewer people actually use it. It's like 4-wheel drive. I have it on my GMC Suburban, but rarely use it. But I will admit that when it snows, I am happy to have it.

457. Is the white ink situated in the same area as the other inks?

458. Does the printer manufacturer supply tips on how the graphic designer should prefer a bit-mapped and a vector-based illustration to use white?

459. Is spot varnish available?

Spot varnish is probably more useful than white ink.

INK Cost

460. Does the refill container of ink come in cartridge, bottles or bulk? How large are the ink containers for this replacement ink?

Ink tends to come either in bottles (where you pour the ink into the ink container on the printer) or containers that are themselves the ink container: you take the old one out; throw it away; and place the new container in its place. Cartridges tend to only be used in printers with Epson printheads. No currently functioning UV printer uses Epson printheads: one Eastech printer tried, but it is not widely used.

461. How many liters of ink does the on-board ink container hold in the main tank?

So far this information has not been easy to find. When you change ink, it is not a good system to pour from a new bottle into an old on-board container. It is better that the system allow you to remove the old container and you add the new container. This has the advantage that you don't end up with old left-over ink in a large gallon container.

Large containers were the first kinds of containers on many UV printers, before manufacturers gathered experience that large containers were not good; indeed large containers could cause problems if the ink gelled or otherwise went bad, or simply became too old.

462. What is the cost per container? What is this cost translated to liters?

Cost of ink varies depending on the dealer/distributor, and depends on what country you are in. Usually the smaller and cheaper the printer, the more the ink costs. The larger the printer is, and the more ink it uses, the lower the ink is priced.

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

Some printers attempt to keep a general track of ink used. But in most cases the count of ink used is a fiction: it is an official estimate only. In a few cases the printer manufacturer would probably not want you to really know how much ink was used. The system also fails unless it counts the ink wasted in cleaning (purging).

A few printers count the actual droplets fired (ColorSpan is one). I would tend to trust this more than a rough estimate.

464. How much ink is used to print a square unit?

465. What is the cost, in ink, per square unit?
Some statistics are misleading. A few companies provide honest answers.

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

467. What is the ink usage compared with a solvent printer?
Several manufacturers of UV-curable inkjet printers are raising the point that because UV printers don't normally spit (some do; but most others don't),that the total ink used is less with a UV printer than with a solvent ink printer.

468. Where is waste ink collected? In a tray? In a bottle?

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

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

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

472. Do you have to drain an on-board container manually? Or just remove one bottle and place an empty bottle in its place?

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

474. How can you see the remaining ink level? ? Do you have to ask to see the ink mode, or is the ink status available at all times?

475. Is there an out-of-ink alarm? Is there a warning before actually being out of ink?

476. What if the operator is out of the room? Does the printer stop?

477. Does the printer send an e-mail message (a nice touch if the printer is operating unattended at night)?

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

479. 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 ink is gradually being offered, but few people use it. They are afraid that their printer manufacturer will not provide tech support any more.

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

481. Do you have to upgrade software every month or so to use ink to foil being able to use after-market ink?
Some printer manufacturers send a software code that changes so that only their official ink cartridges or inks work; after-market ink companies can't keep up since it takes a while for an after-market ink company to create a workaround.

INK: Supply System, Tubing, Filters, etc

482. How much ink does the ink container in the printer hold?

483. How is new ink added? Pouring into the on-board container? Switching the container to the new ink container?
You do not pour new ink into an old container with left-over old ink. A better system is like that added by Raster Printers, namely to throw away the old container and add a completely new container. So when you buy the ink, that same container goes onto the printer and serves as the ink source as long as this bottle has ink.

484. How do you avoid building up old ink inside a large container?
One by one, printer manufacturers are taking their large original on-board ink tanks and replacing them with 1-liter containers (Gandinnovations, Raster Printers and others). The reason is to reduce the chance of gellation, dark cure (partial solidification of the ink from heat rather than from UV light) or any other breakdown of the ink due to old ink building up within a large on-board ink tank. But NUR states that their system is "always mixing the ink." However the long-range goal of a UV ink delivery system should be to use up old ink first, and replace old ink 100% with fresh ink. Then you don't need to mix anything.

My PhD is not in chemistry or physics, but stirred ink does not obviate it ending up as merely gelled ink that continues to be stirred. Being stirred is not what keeps ink from gelling. Gelled ink is bad for the entire ink system, and not good for image quality either.

Other printer manufacturers have other means of trying to get rid of old ink that will tend to gel no matter what. But from my point of view, the best way to get rid of gelled ink is not to have any old ink in your system to begin with.

Of course you also have to control your temperature and light sources, since both these factors can also calls the ink to gel (even if it does not gel in the containers). Fresh ink can gel too….

485. What is the situation with the ink gelling?
Ink gels from heat; not only from UV light (since in theory the inside of the printer will have black ink lines so no UV light can reach the ink). But overall heat will cause UV ink to gel. But if you have some circulation within the tank and if the ink is far from the heat, gellation will not be as much an issue.

486. What filters are on the ink system to trap particles or trap gelled ink?
Particles, impurities, or whatever, can clog the nozzles or otherwise cause the ink not to jet properly in a straight path. So you need filters to trap these particles.

487. How is air removed from the ink delivery system and/or removed from the printhead?
Air in the ink system causes more bad prints than gunk or other particles being in the system.
488. Is ink flow turned off and on with a valve (a manual control) or via the software on the monitor?

489. Describe the ink supply system (to the printhead)?

490. Are ink tubes black, opaque but white, another color, transparent?

491. How often do the ink filters have to be checked? Cleaned? Changed?

492. What does a new ink filter cost?

493. Is there an issue with "ink starvation?"
"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.

494. Where, and in how many locations, is the ink heated?

495. To what degree is the ink heated?
Most UV-curable ink comes in a sort of thick or almost syrup-like consistency. It has to be heated before it is liquid enough to jet through the printhead nozzles.

496. Can the end-user vary the printhead temperature, or is the temperature fixed?
It is not advised to change the printhead (ink) temperature arbitrarily. However in certain situations, a sophisticated end-user, with a high level of knowledge of the overall ink chemistry, UV-curing situation, and experience in the ramifications of varying the factory-set temperature, then changing the temperature could be considered.

497. How long does it take to heat the ink in the morning at startup?

498. Has any misting or spray been reported? What about ink inside the machine parts?
Most brochures never speak of this issue, or how to overcome it. Misting may be confused with erratic satellite drops. But they are not the same. By misting I mean ink that mists up inside the printer and never reaches the substrate. Misting, if bad, may coat the inside of the printer with ink mist.

One possible cause of misting is having the distance between the printhead and the material too far apart. So the ink vaporizes before it reaches the material.

So, yes, misting does tend to occur (in most UV printers; they just don't talk about it). Zund is one of the few companies that warns you of the health risks with misting UV ink.

INK: General Knowledge

499. Is there an oxygen inhibition effect with your inks?
If you attend the IMI conferences you can understand this chemistry question.

500. What about dot gain?

501. Any problems with mottling?

502. Are there any problems with film shrinkage?

INK: Longevity

503. To what degree can you expect cracking of the resultant image if on a flexible substrate?

504. What about longevity indoors: where people or objects may scratch, smudge, or rub against the printed surface?

505. What is the longevity outdoors? What about in the full sun in direct sunlight?
In some cases the ink may last longer than the material on which it is printed.

506. 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)

• Acetone

• Cleaning alcohol

• Gasoline

• Soap and water with sponge

Sample of a billboard longevity outdoors with direct sunlight

• Soap and water with a broom
(frequently used to clean vehicle wraps in Latin America, for example)

• Scotch-tape pull-off test

INK Color Gamut

507. Which colors print best?
See below.

508. What about silver or other metallics?

509. Which colors print poorly or not at all?
See below

510. Is the color gamut what your clients need for their logos and products? How about red?Does it turn out more orange? Is red bright enough in saturation to satisfy clients? Or are the colors overall a bit dull?

Many clients will not be familiar with Pantone colors. These clients will have used cut vinyl in the past, so they will bring in a sample of this old vinyl and ask that the digital print shop match the color of their vinyl.

Printed with DuPont™ Cromaprint™ 22 UV

UV-cured ink has the following tendencies. This is true for most UV-cured ink, though some (such as the ink from Vutek) are poorer in color gamut than others. The tendencies are:

• Reds are too orange or too magenta
• There is generally not much variation in the spectrum: so that too much of the red spectrum is simply magenta or rose-pink colored.
• Same with green and yellow: there is too much yellow in the green and too much green in the yellow.
• Blue and cyan are intense: purple can be over-saturated, dark, and without much variation between pink and cyan.

511. Does black ink have more gloss than CMYK inks? Does this make areas of black ink stand out as different?

THE UV CURING LAMPS

512. How many different sets of lamps are there? Is there pinning first and then curing later?
95% of UV-curable printers have only curing UV lamps. Only the Inca Spyder 150 and a few other innovative machines have a pinning lamp before the curing lamp.

513. What technology is used in curing lamps: microwave, continuous (mercury arc), LED, or flash (pulsed Xenon)?
Virtually all UV printers use mercury arc UV lamps. Only NUR and a few others use microwave UV lamps. Pulsed Xenon lamps have failed the few times they were tried (an early VUTEk UV printer circa 2000-2001; a cheap Oce Arizona 60uv printer). LED lamps are now being tried in several UV printers, such as by Sun LLC (in Russia). The Gerber Solara ion uses a rare type of long UV lamp that is not used by any other wide-format inkjet printer manufacturer.

UV lamp

514. How many watts are the lamps?

515. What wave length do the lamps cover?

516. Are the lamps special in order to accommodate white ink?
Usually a minute to a few minutes in the morning. Perhaps less later in the day. It may take longer to warm up the ink than to warm up the lamps.

Sun Neo UV LED lamp

517. What is warm up time?

518. How long can the lamps stay on before they automatically shut off?

519. What about shut-down sequence, shut-down time, and wait-time before restrike?

520. What brand of lamp is used?
The FLAAR Reports on UV lamps discusses the various brands of UV lamps that are available.

521. How many lamps does the printer use?
Most normal UV printers have two lamps, one for each direction of printing. A few printers have three lamps. Some printers, such as the Inca Spyder 150, have one set of lamps for pinning; another set for deeper final curing.
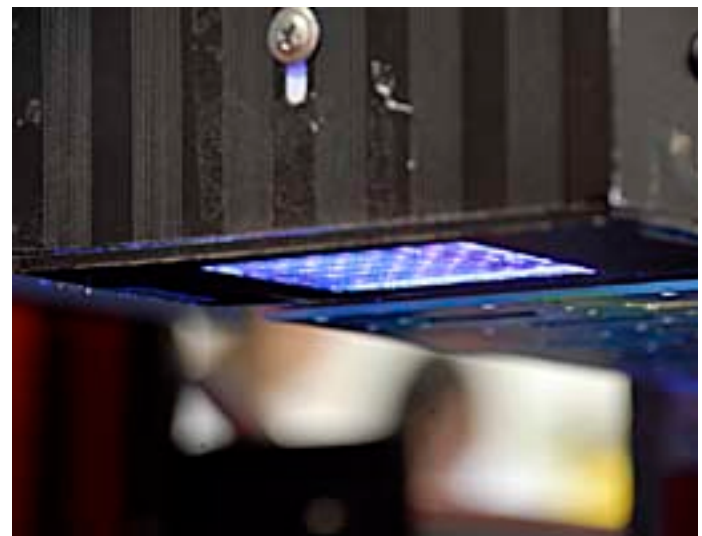
522. Can you have one lamp on one setting and the other lamp on another setting? Or do both lamps have to be on the identical setting?
Only the more sophisticated printers have sophisticated options.

523. What shuts the lamps off? For example, after so many minutes of not being used; or if they overheat?
The lamps should shut off after so-many minutes of no use.

Obviously the lamps should shut off if they overheat, but do cheap printers offer this safety feature?

524. How long does the lamp last, in terms of hours of operation?
Most lamps last 1000 hours. Each strike may use up the equivalent of 2 or 3 hours.

525. How many hours are used up by each "strike" (by each time you turn the lamps on)?
GCC is one of the few companies that clearly, specifically, and openly mentions how many hours are wasted by each strike: namely three hours.

526. 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.

527. How do you keep track of lamp-hours?
This is a challenge if your system does not have a foolproof system built in.

528. How much does each replacement lamp cost?
Cost can vary considerably, from $300 up into a thousand dollars. Remember, you have to replace all lamps at the same time. Not just one.

529. Is the UV curing assembly (lamp included) user-replaceable? If so, how easily or difficult is self replacement?
Most lamps can be replaced in 10 minutes. The Oce Arizona T220 UV had the most complex access to its lamps. Clearly it was designed by a committee of engineers, who understand every inch of the insides. But I pity any end-user who had to figure out how to get anywhere near the Oce lamp; it was that complex.

530. Can the lamp alone be replaced or does the whole assembly need replacement?

531. Is there a lamp/assembly trade-in program available? If so, what percentage of the lamp's MSRP is offset by the trade-in?

532. What is the true drying (curing) time of the inks used with this set of lamps?
What factors influence the true (total) drying time?
No UV ink really cures within seconds. Some colors, depending on how thick the ink is laid down, may cure "instantly." But several factors may result in a cure that takes 24 hours, 48 hours, or weeks. If you set the print mode for "glossy" this reduces the lamp intensity. These prints will outgas for weeks.

UV LAMPS: Cooling

533. Are there shutters?

If there is no shutter this means that neither the light nor the heat is shuttered out when the lamp is at the end of its path or when otherwise it would be good to minimize both heat and UV light.

534. How often do the shutters stick?

The shutters on the Gandinnovations printer are pneumatic, so don't stick as often as mechanical shutters. DuPont Cromaprint 22uv printer seems to have issues with its shutters getting stuck (either stuck open or stuck shut). So DuPont had to switch to another solution. We occasionally hear of shutters of other brands of printers sticking as well. Indeed one company said they don't use shutters at all due to the possibility of them not opening or closing. Making them pneumatic resolves many of these issues. Of course one reason for not using shutters is to save cost. Most Chinese printers and low-cost UV printers made in the US and elsewhere may skip shutters.

535. What settings to the shutters have?

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

Most UV lamps are cooled with simple fans. The downside of air-cooling is that the air currents anywhere below the printhead nozzles can blow the ink droplets around, causing the droplets to hit off target.

537. How many fans are there per lamp?

538. How many settings do the lamps have? Or are the fans just Off and On?

Each different media may need a different lamp setting. If you can set the lamps only for High and Low, or even for High, Medium, and Low, that is not good enough for achieving professional results. If your lamps are at the wrong temperature (because you can't vary the temperature adequately), you will get banding because the ink is being over-cooked.

Most entry-level printers have only High and Low. Other printers have High, Medium, and Low. The Gandinnovations UV printer has continuous gradations; you can select anywhere from 0% to 100% power for the UV lamps.

The Durst offers 10 levels, distinguished in part by selecting matte finish to glossy finish. Plus you can create user-defined levels.

539. Or are the UV lamps adjustable automatically based on how hot the lamp area is?

540. Are there fans elsewhere in the printhead carriage area?

541. What other fans are there in the printer, or exhaust ports?

542. 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?

543. How long does it take to cool the lamps down before you can touch them to change them?

The operator's instructions for the Durst Rho 800 Presto is the first user's manual where I have seen mention of how long you need to let the lamp cool down enough to touch it safely: they recommend one hour.

UV LAMPS: Reflectors

544. Is the curing unit totally enclosed?

545. What kind of reflectors are used?

546. Are the reflectors X-blue?
X-Blue reflectors lower the heat considerably, roughly in half. One company that offers X-Blue reflectors is Printword GmbH, www.printworld-machines.de.

547. Do lamps have dichroic reflectors?
To learn about dichroic glass, Google it. You will find enough reading material to keep you busy for hours. One site I enjoyed was www.inspirationfarm.com/GG/articles/article9.html.

548. Do the lamps have water-based cooling?

549. How often do you need to replace the reflectors? What does this cost?
You should replace the reflectors after you have replaced the lamps two or three times.

RIP SOFTWARE & Printer Software

550. Which RIPs are featured?

551. Does the price of the printer include a RIP?

552. 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?

553. Is a computer and monitor included (to run the RIP)?

554. What kind of monitor is included with the printer's computer?

555. Is the included RIP fine-tuned for this printer, or merely the RIP that the manufacturer happens to favor. For example, how does this RIP handle the sequence of placement of white ink? How will this RIP handle spot varnish or other spot colors in the future?

Caldera RIP

556. If no RIP is bundled with the printer, how many and which RIP brands can work with this printer? What is your rating of these various RIPs? Is one RIP brand preferred more then another by current users?

557. If a RIP is bundled with the printer, might you later wish to add an after-market RIP to be fully satisfied?

558. Is your printer and/or RIP Pantone certified?

559. What about the printer's own software?

COLOR MANAGEMENT FEATURES

560. What color management sensors or measuring tools are on-board?
ColorSpan has color management tools built into its UV printers, but otherwise this feature is not yet available on other brands of UV-curing wide-format inkjet printers.

PRODUCTIVITY & ROI (Return on Investment)

561. What productivity claims does the printer manufacturer made?
Linear inches a minute is a more realistic measure of productivity than square feet because square foot measurements assume the bed is full. Most jobs do not necessarily include a full bed of material.

562. Can you sell the output at the machine's fastest output speed or is the quality at that speed not acceptable to most client standards?

563. 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. For example, the height adjustment for the printheads on this machine are entirely manual. You have to loosen a bolt, adjust screw, move things, fix a bolt, etc. The result is that few printer operators will bother to do this. The result of that is banding defects.

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.

564. What is the level of productivity, high, medium, low?

565. How many of this printer would a shop have to buy to be as productive as the fastest of the UV-curable printers actually available today?
The productivity figures given in spec sheets vary from fiction to misleading. First, the "draft mode," or whatever jargon they use for the fastest mode is best translated as junk mode. In most cases you can't sell output from the draft mode to a discerning client. Yes, it is true, that if put up on a billboard and viewed from 100 feet driving down the highway at 80 miles an hour you won't see the low dpi. But most clients want to feel that their images are somewhat better than this.

If the printer you are considering is a flatbed, then the printing statistics are virtually useless because they only show speed if the entire bed is covered and don't take into account loading, cleaning, and off-loading the materials.

566. Can this printer hold up to two or three shifts per day all week?

567. Does this printer have to be turned off to rest between shifts?

ADVERTISING CLAIMS:

568. How do the prints you achieve compare with prints you see displayed at a trade show (where full-time tech support is available the entire time)?

569. How does the actual printer compare with what was claimed in the ads?
Be sure that you are fully aware of the realistic throughput, and that virtually no manufacturer reveals the complete truth about speed. They don't tell you that the speeds they claim in their spec sheet are unrealistic and have blemishes that many clients would not accept.

570. How would an outsider describe your printer? Not how your ads claim, but how do other people view your printer as to whether it is easy to use, takes care of itself, does not require you to personally become a repair or maintenance technician.

571. What advertising claims use silly adjectives such as "blazing" speed?

572. What advertising claims use smoke-and-mirrors to hide something, or make a claim that is not realistic?

573. Are there any problems serious enough to have caused serious complaints to either resellers or the manufacturer relative to color management, mechanical aspects, printheads, banding defects, skewing of media, incompatibility with inks or media or other aspects that could be deemed pertinent?

574. What surveys have been done of user satisfaction of your printer?

575. What is the difference between problems with this new model and problems with the older previous model?

576. What about the inherent, systematic problems of printers, especially banding issues and other well known but seldom openly discussed problems with piezo-electric heads? What about ozone fading issue? Outgassing issue? Metamerism? What defects, or good features, do the user groups and list servers discuss the most about this printer?

577. Rate the problems in the initial introduction of the printer, between the first ads and/or first showing or mention of the printer at tradeshows or in trade magazines. To what degree were early buyers also beta testers? That is, how well do early versions of the printer function?

578. What have been recurring maintenance issues?

579. Are any systematic mechanical problems documented? For example, if you asked outside industry experts would they reply, "ah, yes, Printer ABC is known for potential XYZ glitches."

580. What parts have broken down since you have had the printer?
This is a question you need to ask during a site-visit to a printshop. When you ask the manufacturer, you will rarely be told the complete list of weak parts that tend to break.

581. 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, though I have seen it with almost any old printer over four years old if they are used every day all year.

582. Have there been any recalls of this printer or any hardware or software features that have been replaced on a notable number of the printers?
ColorSpan, via HP, had, in effect, a recall on all its model 5440uv series during early 2008. The ink pump had to be replaced by a completely redesigned one. The 5440uv series had a host of systematic problems during its first years.

583. How often do people return this printer and say they want their money back?
This is mainly with Chinese-made printers. But, any time you are seriously thinking of any printer it is essential to learn what the recall or return rate is. In other words: how many printshops return this printer because it is either not what they expected or not what they need.

This does not automatically mean that the printer is bad; it may mean that the printshop had an unrealistic expectation. Sometimes the printshop did not anticipate how much maintenance and care the printer needed in the evening and in the morning.

It is likely that every single brand out there has printers they have had to take back. But you ought to learn how many, and why. See if there are patterns, and learn how the manufacturer has reacted to so many returns.

If the manufacturer, distributor or reseller is honest and gives you the actual facts, this is a company to trust.

If they say there have been no returns, this is statistically unlikely.

584. What is it about the printer that they dislike? Lack of features? Or the actual performance is not really what is claimed in the alluring advertisements?
The more an advertisement exaggerates, the more likely the end-user will be disappointed with their purchase. If a magazine ad claims "blazing speed" you can be sure that the printer is slow compared to it's competitors.

GENERAL CONSIDERATIONS

585. 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.[3]

Some printer manufacturers falsely inflate sales figures in the early months, to make it sound like everyone else is stampeding to buy their new printer. Kodak did this ploy with their water-based Kodak 5260 printer. They misrepresented how many had been sold. What was ironic is that when one dealer sued because the printer was unusable, Kodak countered with the argument that the printer was only a concept, and was never really offered for sale (which was a not true).

The standard game is to claim a number of printers sold, lets say 240, and tell everyone this is how many have been pre-sold (sold before the printer is even finished). What this means is that about 100 printshops have expressed interest (and this is listed as a sale). The missing 140 sales are conjured up based on estimates of how many printers distributors and dealers worldwide might buy in the first quarter. So this 140 does not mean any printshop has actually bought them.

586. What surveys have been done of user satisfaction of this printer? Have these surveys turned up information that a buyer of the printer should know about?

It Is rare for an end-user to have access to a survey of satisfaction. Be wary of the Success Stories that are published in trade magazines: most are unrealistic at best. Why, for example, was there a Success Story on the DuPont Chromaprint 22uv when this printer was still a nightmare for most owners? If this printer was as good as claimed by the Success Story, then why did DuPont abandon trying to sell and service them?

587. What will the resale value of your printer be in three to five years?

If a printer manufacturer is weak, about to go out of business, or has an iffy reputation, the resale is close to zero.

Most printers from Chinese manufacturers have a low resale value.

So a DuPont Cromaprint 22UV printer would have a low to poor resale value. But a Durst Rho 205 or even earlier Rho 160 has an acceptable resale value (considering most printshops have paid for their printer already by the second or third year).

Just be aware that resale value varies tremendously: Gandinnovations and Durst would have good resale value.

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[3]*This question is necessary to handle situations when a printer model is announced, is placed on sale, but does not yet actually function. Manufacturers may claim the reason you can't actually take delivery on the printer, or even see one at a tradeshow, is because the printer was so fabulous that the entire production run was sold in some far-away distant country. This ruse actually happened with the Kodak 5260 as well as the earlier CrystalJet. One of the Summa printers was also delayed for years before it functioned well enough to sell. So there are specific reasons for every question in the evaluation process.*

COMPARISONS WITH OTHER PRINTERS

588. When people are considering buying this printer, what other printer(s) are they also looking at?

589. What features on the other printers may be issues?

590. What aspects of the selected printer help decide in its favor?

SUMMARY: Image Quality Issues: Banding

591. Is there banding in areas of solid black?

592. What causes banding in this particular system?

593. How can banding be avoided?

594. How much banding is reported with this particular printhead?

595. Can you vary the material feed rate?

SUMMARY: Image Quality Issues: General

596. What about satellite drops which cause edge splatter?

597. What causes edge splatter (in addition to satellite drops)? Ink splatter is visible either where a dark color adjoins a lighter area, or with black text against a lighter background.
Splatter of ink means droplets outside the intended area. You see this on all text or wherever one color changes to another color. One tech support person suggested splatter was caused by satellite drops. Evidently a high firing frequency develops more satellite droplets. It was also suggested that splatter could come from mis-registration between heads, or simply bad ink.

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

599. What about the dot pattern? Is the image grainy (like sand) or is the image smooth as you would expect of a photograph?

600. 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?

601. Does achieving glossy take more time to print? Does glossy output outgas more, and for a longer time (because it is not cured as thoroughly with UV light?).

602. Can the system produce matte, and intermediate surfaces such as satin? Is one surface faster or slower to produce, or have any other tradeoffs?

603. Are their issues with gloss differential or bronzing?

604. 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.

605. How good is the adhesion of the ink? To what degree can we expect cracking of the resultant image if on a flexible substrate?

606. What about abrasion (scratch) resistance? How susceptible is the ink to abrasion?

607. When the media flexes, does the ink hold on? Stretch? Break with stretch marks? To what degree can we expect cracking of the resultant image if on a flexible substrate?

608. Explain shrinkage of the ink film and the degree to which thick layers of ink might wrinkle?

609. Is enough ink laid down? Density of ink-laydown may affect color to some degree and definitely will effect saturation. A printer that attempts speed may result in less ink being laid down.

CONCLUSIONS:

610. Are you satisfied with this printer to the point that you would recommend it to someone else?
The highest accolade of all, is when a print shop buys a second machine from the same manufacturer and dealer. So far we note this primarily for ColorSpan owners and Gandinnovation owners. We have heard of places with two Durst Rho printers too.

611. Are your customers satisfied with the print results from this UV-flatbed to the point that they recommend you by word of mouth to other potential clients?

612. If so, why would you recommend that others buy this same printer?

613. If you are dissatisfied, what about the advertising or other claims made you want to buy this in the beginning, and why do you now feel disillusioned?

614. If your customers are unhappy, what about the prints makes your clients dissatisfied?

Reality Check

Being at a university absolutely does not mean we know everything. But intellectual curiosity often leads us to enter areas that are new to us. So we do not shirk from entering areas where we are obviously not yet expert. If in your years of wide format printing experience have encountered results different that ours, please let us know at ReaderService@ FLAAR.org. We do not mind eating crow, though so far it is primarily a different philosophy we practice, since we are not dependent on sales commissions we can openly list the glitches and defects of those printers that have an occasional problem.

FLAAR and the university have corporate sponsors but FLAAR web sites do not accept advertising, so we don't have to kowtow to resellers or manufacturers. We respect their experience and opinion, but we prefer to utilize our own common sense, our in-house experiences, the results from site-visit case studies, and comments from the more than 49,000 of our many readers who have shared their experiences with us via e-mail (the Survey Forms).

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Update Policy

Starting in 2008, updates on UV-curable wide-format inkjet printers are available for all individuals and companies which have a subscription, or to companies who are research project sponsors. To obtain the next update write ReaderService@FLAAR.org.

There is a free PDF that describes the UV-curable inkjet printer Subscription system. Subscriptions are available only for UV-related wide-format printer publications.

FLAAR Reports on UV-curable roll-to-roll, flatbed, hybrid, and combo printers are updated when new information is available. We tend to update the reports on new printers, on printers that readers ask about the most, and on printers where access is facilitated (such as factory visits, demo-room visits, etc).

Reports on obsolete printers, discontinued printers, or printers that not enough people ask about, tend not to be updated.

FLAAR still publishes individual reports on solvent printers, and on giclee printers, but subscriptions on these are not yet available; these FLAAR Reports on solvent, eco-solvent, and water-based wide format printers have to be purchased one by one.

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.

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 license the report or otherwise notify us in advance. FLAAR reports are being updated every week 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.

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.

But 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. For ink and media, especially after-market third-party ink and media, it is essential that you test it first, under your conditions. We have no way to assure that any ink or media will be acceptable for your specific needs in your specific print shop. 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. Other images make be "faked" in the sense of slyly putting on primer without telling the people who inspect the prints. Most UV inks don't stick to all materials; many materials need to be treated.

Or the UV prints may be top-coated so that you can't do a realistic scratch test.

Booth personnel have many standard tricks that they use to make their output look gorgeous. In about half the cases you will not likely obtain these results in real life: in most cases they are printing uni-directional, which may be twice as slow as bi-directional.

Trade show examples tend to be 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. Five 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.

And many materials don't feed well through hybrid (pinch roller on grit roller systems) or combo UV systems (with transport belts). Banding, both from poor feeding, and from bi-directional (lawnmower effect) are common on many UV-curable inkjet printers.

Heat, humidity, static, 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 test results or demo room results.

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.

So if we inspect a printer in a printshop (a site-visit case study), and that owner/operator is content with their printer and we mention this; don't expect that you will automatically get the same results in your own printshop.

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 many of the issues are 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.

The major causes of printer breakdown and failure is lack of maintenance, poor maintenance, spotty maintenance, or trying to jerry-rig some part of the printer. The equally common cause of printer breakdown is improper use, generally due from lack of

training or experience. Another factor is whether you utilize your printer all day every day. Most solvent and UV printers work best if used frequently. If you are not going to use your printer for two or three days, you have to put flush into the system and prepare it for hibernation (even if for only four or five days). Then you have to flush the ink system all over again.

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.

Also realize that no hybrid or combo UV printer can feed all kinds of rigid materials precisely. Some materials feed well; others feed poorly; others will skew.

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.

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

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 Heweltt-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.
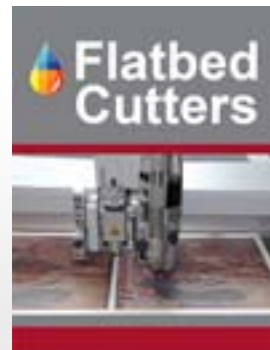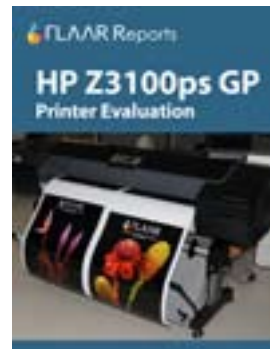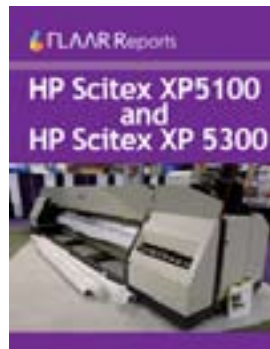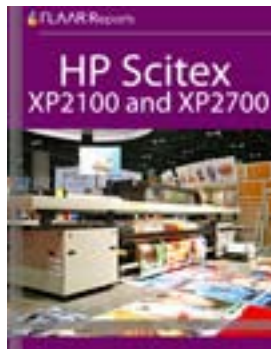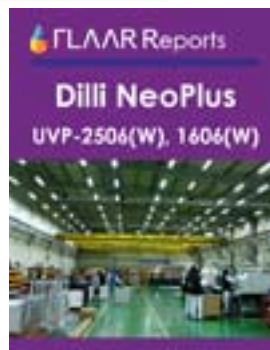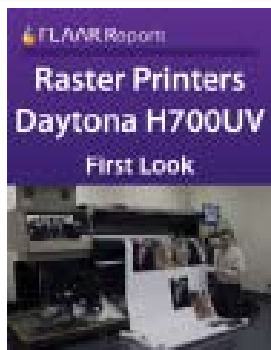
FLAAR also covers its costs of maintaining the immense system of 8 web sites in three languages and its university facilities in part by serving as a consultant such as assisting inkjet manufacturers learn more about the pros and cons of their own printers as well as how to improve their next generation 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.
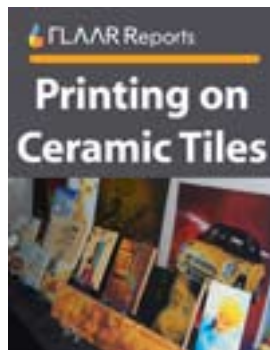
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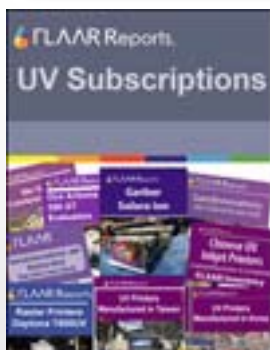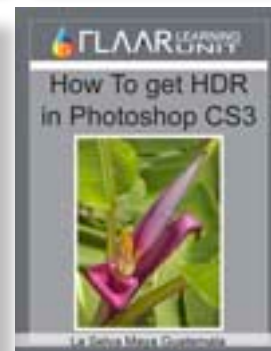You can find these and more reports at: www.wide-format-printers.NET

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can be obtained at no cost by filling out the Survey-Inquiry Form, which you can find by clicking on the "Access to Survey for Free FLAAR Reports" link on www.wide-format-printers.NET

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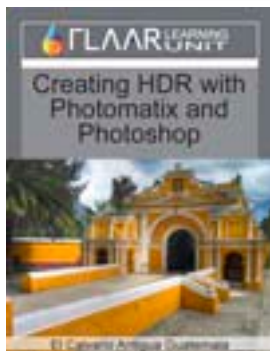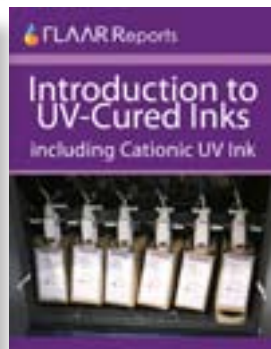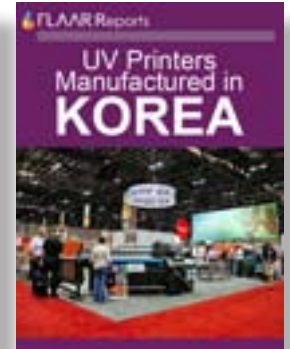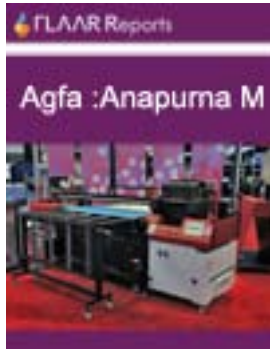You can find these and more reports at: www.wide-format-printers.NET

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Gandinnovations Jeti 1224 UV & Jeti 2030

Creating HDR with Photomatix and Photoshop

Creating HDR with Photomatix and Photoshop

Creating HDR with Photomatix and Photoshop

How To get HDR in Photoshop CS3

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UV Subscriptions

Each month Dr Nicholas Hellmuth travels around the world to investigate and learn more about the new technology.

This site is dedicated to bring you the latest facts on UV-Curable systems, that's why you will find the newest information, if you acquire your Subscription you will have access to these and more FLAAR Reports.

You can have more information at ReaderService@FLAAR.org