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High-Quality, yet Affordable Entry-Level UV Combo Printer

EFI Rastek H650

Contents

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THE BASICS

1. Brand name, model?
EFI Rastek H650

2. If there are two or three (or more) widths of this printer, what differences exist other than the width?
This printer only comes in one version. The EFI Rastek H700 is classified as a different model, although the H650 was designed with knowledge and experience from the H700.

3. What is the nature of the company? Is this company the manufacturer, distributor, or rebranding a machine made by someone else?
EFI owns Rastek. Rastek has their combo style printers manufactured by RTZ. I have visited the factory and have inspected the H650 at many trade shows around the world.

4. What other printers are the same or similar chassis from this manufacturer or distributor?
As mentioned earlier, this model shares some features with the H700 model, but the designers also have experience with the T660 although the latter is a dedicated flatbed and was made by ISI.

5. Is this same model(s) rebranded and sold under other names?
Not at the moment. EFI Rastek has the exclusive distributorship over this model. Flora OEMs the H700 and have exhibited their version as the Flora F1-180UV, but you won't find a Flora version of the EFI Rastek H650.

EFI Rastek H650 printer at Sign Africa '09. These photos of the event at South Africa were being taken while the notes were being written.

6. What other printers of other brands are comparable?

The most similar printer I can think of is the new GCC StellarJET K72UV—both printers are in an entry-level price range, and the print width is similar. Other printers are the combo machines from Dilli, although the Neo Titan is around $120,000. Traditionally, UV combo printers have been in the mid range price, ($90,000 to $150,000 approximately).

There is no industry-wide nomenclature standards, but FLAAR designates any printer with a moving transport belt as a combo. We call a hybrid printer a retrofitted solvent printer (pinch rollers and grit rollers). The H650 (and the H700) is definitely not a pinch-roller style (transport belt style printers tend to be better than a pinch roller system).

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

The H650 and the H700 have a similar media transport mechanism: a conveyor belt (or transport belt). These printers use the same Toshiba Tec print-heads. Both printers use the same ink.

At Sign Africa '09 we were told that the dancer bar of the H650 has been improved and it works better than the dancer bar on the H700.

We could photograph the H650 combo printer for the first time at FESPA '09. This trade show was characterized for the launch of several models from different companies, although the printers launched were considered versions of existing models. The H650 can be considered a smaller, more affordable version of the EFI Rastek H700. It also has some similarities with the T660, although that is a dedicated flatbed.

8. When and where was this model first introduced?

The model was officially launched at FESPA Amsterdam '09, but it was shown a few months earlier at ISA '09 in a private room.

9. What is the history of the development of this printer?

Raster Printers worked with Flora for 6 years and Flora has considerably improved its quality during this period of time. What makes the H650 different from the other Rastek models is that, instead of just accepting another model, EFI Rastek specified the manufacturer all the details required for this machine. So it was a joint effort to design and manufacture this printer that is the first brainchild of the EFI-Rastek fusion.

10. What is the philosophy behind the development of this printer? What did the manufacturer seek to achieve?

EFI Rastek is trying to reach small sign shops that have a small Mimaki or Roland solvent printer and want to jump to UV applications. Most small sign shop owners can't afford a $100,000 machine, so the EFI Rastek H650 is a simpler, more affordable UV printer yet offering the same print quality as the H700 printer.

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

This summer the printer was in beta. It was in alpha from January to March 2009. It will be totally out of beta by the end of September 2009.

12. List price?

$64,995 for the basic model (CMYK). If you need white ink, the price is $69,995.

13. 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?

Yes, you receive a full set of ink bottles (1 lt. per color). One set of inks can print around 4000 sq. feet or 400 sq. meters.

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

In some locations the electric current is not constant. In such a location it would be advisable to have a UPS unit. At the end of the shift only the vacuum system for the printheads stays on.

The printer was just been set up by the technician at EFI Rastek offices in San Jose, California. This is perhaps the most affordable wide-format UV combo printer among the models of reliable manufacturers. There are other high-quality combo printers but those are twice the price of the EFI Rastek H650.

15. Do you need to provide air pressure for negative pressure for ink in printheads? Do you need to provide compressed air for any other purpose?

You don't need an external source of air pressure. There is a built-in negative pressure system for the printheads.

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

Rastek does not recommend buying a spare parts kit, especially because the end-user is not expected to make any serious replacements. Spare parts are stocked in California and in Amsterdam. So, if you call even at 5pm to ask for a component, EFI Rastek is able to deliver it within the first hours of the next day.

Most end-users don't wish to buy a spare parts kit up front, in part because they don't yet have the experience to do their own repairs when they are first buying this printer.

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

Every printer manufacturer and distributor has their own policy on whether they wish the end-users to make their own repairs. The philosophy of ColorSpan was to keep the end-user from fiddling with anything inside the printer. This was logical because many were first-time users of this kind of printer. The downside was that once you became experienced, or if your printshop was already advanced, the lack of access to the innards of the printer was self-defeating and undesired.

But there is no right or wrong policy (ColorSpan is not "wrong," they are simply trying to protect newbie's from making a mess of the inside of the printer. In general, the end-user is usually 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. Some manufacturers discourage this, but some manufacturers do allow end-users to take advanced service training.

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

$8,000 for a basic kit, but it can be as low as $1000 depending of what you need.

PURCHASING

19. 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?

Most dealers are regional; some operate only in a city. Grimco is strong in some regions of the US. Global Imaging serves the entire US and some parts of Latin America. EFI has divisions for:
- North America
- Latin America
- EMA (Europe, Middle East and Africa)
- Asia Pacific (covers Singapore and Australia)

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

Yes, some distributors have a leasing program. The leasing contract can be approved in 24 hours.

EFI Rastek H700 at ISA'09, in the booth of GRIMCO. This is one of the distributors of EFI Rastek printers in the US.

FEATURES OF THE PRINTER: Vacuum

21. Is there a vacuum function?

Yes, there is a vacuum system that works through the belt.

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

Vacuum is created by an air pump.

23. If pumps, how many pumps are there?
One pump. This is another difference between this model and the EFI Rastek H700, which uses two pumps.

24. In how many sections?
There are four sections.

25. Are the vacuum areas (size and position) user definable?
No. They are fixed.

26. Can you turn one or the other section(s) off and on?
Yes. At the right you find the valves where you control the vacuum sections.

27. Just Off and On? Or variable?
The sections are either off or on.

28. 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?
Ideally, media needs to be totally flat, otherwise it could cause issues. This is why MDO boards tend to be difficult to print on.

With the Mimaki JF-1631, 1610, the Oce Arizona 250, and the Gerber ion it is necessary to put paper or thin foam core material on top of the entire flatbed area where you are not printing. If you don't do this, those vacuum holes will suck open air and there will not be enough vacuum under the piece of material that you need to print on. But I have also seen flatbed printers costing $300,000 also requiring this, such as Gandinnovations Jeti flatbeds.

The vacuum is generated by one air pump located below the printing area. To have the pump inside the body of the printer is a plus considering that some printer manufacturers have a bulky air pump sitting next to the printer.

In this rear view of the printer you can see the location of the valves that control the vacuum sections.

STRUCTURE OF THE PRINTER: Media Transport Mechanism & Media Path

29. Is there a moving transport belt (combo style) or a stationary platen (hybrid style)?
Yes. Media is moved with a transport belt

30. Describe the platen.
The platen is about 12" x 65". It is located in the middle of the print area in the Y axis and it has vacuum holes.

31. Are there edge guards at each side (end) of the platen? At left, or at right, or both?
No. A combo system doesn't need edge guards, since it is transported by the conveyor belt.

32. Was this printer made originally as a UV-curable ink printer, or is it retrofitted with UV-curing? If retrofitted, what was the original brand or model?
This printer was designed and built from the ground up to be a UV-curable printer. Retrofitting a solvent chassis was common in the early days of UV technology.
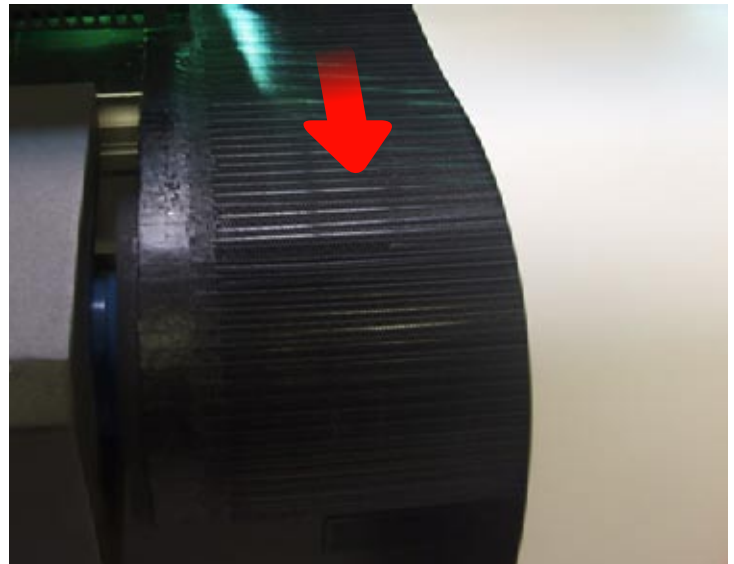
Media is moved with a transport belt. These type of printers are known as combo, although there is no official nomenclature and some manufacturers call this media transport mechanism "hybrid".

STRUCTURE OF THE PRINTER (if a combo style): Transport Belt

33. Describe the transport belt? What material? What manufacturer?
This is a wired mesh belt. This type of transport belt is popular among entry-level and mid-range printers. You can see it on printers like GCC, Dilli, Agfa, IP&I and others. The Grapo Octopus is a printer in these price ranges that uses a drilled-type solid transport belt.

34. Size, does the transport belt stick out, at the front? Or at the back?
No. The belt does not stick out at the front nor at the back.

35. Can the belt move forwards and backwards, or only forwards?
Yes, it can be moved in both directions.
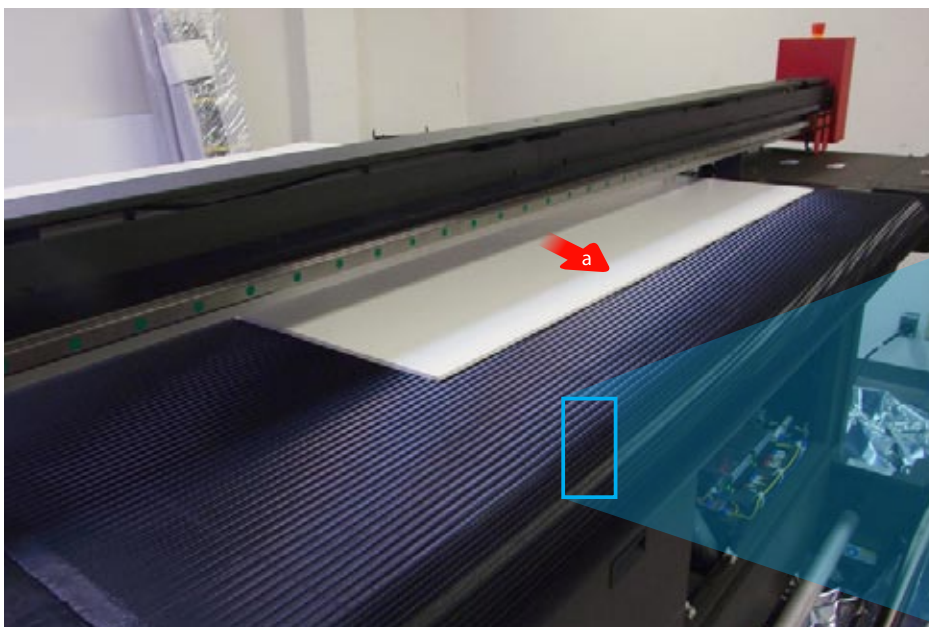
I only began to ask this question when I learned that the transport belt of the Sun Neo LED Evolution could go either forwards or backwards. The reason on that printer is because the white ink heads are set behind the others. So if you want to do a pre flood coat you print in one sequence; if you need to do a post white ink layer, you move the material in the opposite direction.
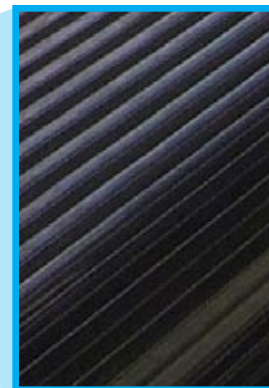
One of the advantages of this type of transport belt is that you can flip it over instead of replacing it.

Media is moved forward (a) by the transport belt.

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

The front roller is the drive roller; the movement is generated by a servo motor made by Fuji located at the front right.

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, as does the new Shark from Grapo. 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.

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

This type of transport belt was chosen in part because of the price. It is very inexpensive; it costs $350 to replace.

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). Some transport belts "wander" if they are not calibrated. This is not serious for roll-fed materials, but is not good for flat materials.

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

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

It holds up to heavy use, but the whole system was designed to work on a normal shift per day.

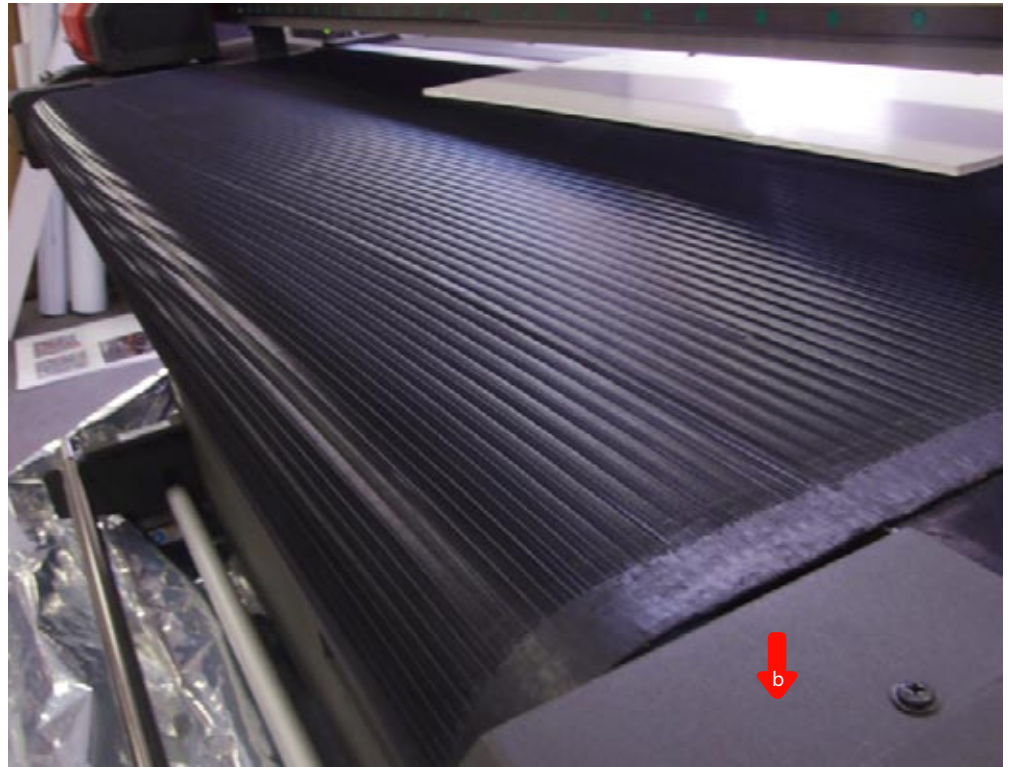*The movement of all the transport belt mechanism is generated by a servo motor located at front right (b).*

There is a procedure to set up the belt. If followed properly, you shouldn't have problems with it skewing. As soon as we can check end-users who have had this printer six months we can report back how the belt holds up.

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.

39. 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 can put paper under your thin, sensible media to avoid any mark; vacuum still works through the paper.

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

Perhaps once every two years. As mentioned earlier, this belt is very inexpensive.

Most end-users will change the belt more often because it is dirty (stained with ink) than because it has some kind of problem. If you are thinking to replace your belt because it is dirty, you can just flip it over.

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.

So this is one aspect of the printer that we will keep in view. But so far, on printers such as the Durst Rho, I have never heard of them having serious or consistent problems with their transport belts.

LINING UP FLAT MATERIAL (to help it feed straight)

41. How is rigid media fed?
Media is fed from the back.

42. Is there a registration gate that is lowered across the back printing area?
There is a system of two registration elements that can be slid along the bridge. These are called stops.

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 (on one end).

43. Where is the registration gate located? At the back? Under the carriage? Or in the front?
These registration stops are moved at the front.
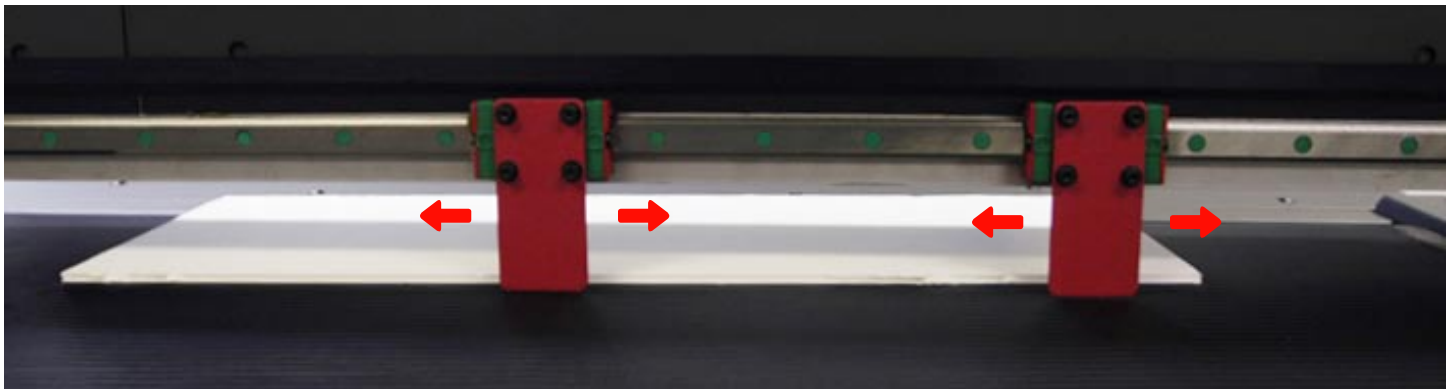
You can slide manually the alignment stops all the way along the print width.

44. Is there any other feature that assists in aligning the ability to feed multiple small materials simultaneously?
The Legend 72HUV has a clever accessory that you attach to almost any location on the top of the table to set up feeding paths to align multiple boards for simultaneous printing.

45. Is two-sided printing realistic? Is there a mechanism for registering the position of the image on the second side?
Yes it is realistic. The only time where it is not realistic is when your media is transparent and you need millimetric precision in the registration.

46. Do you have to hand measure the media height, to enter it manually into the software?
You adjust the height manually. You would need to know the height of your media in advance. For half inch media, print head gap should be set at 13.54 mm (media thickness plus 1 mm).

FLATBED ASPECTS

47. If a dedicated flatbed, how many sections is the flatbed divided into?
You adjust the height manually. You would need to know the height of your media in advance. For ½" thick media, a ¾" carriage height is recommended.

48. How much weight can the printer hold?
Maximum media weight is 100 lbs.

49. 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 (except on some of the newer million-dollar printer systems). But if you have a top-of-the-line combo printer, such as the Durst Rho 700 or 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 less 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. Oce is the first with a functioning version of this double concept. (Gerber unfortunately is doing all their printing across the short axis).

ROLL-FED

50. How is media held flat? Vacuum table? Pinch rollers?
Roll-fed media is held flat by the vacuum system working through the transport belt.

51. How is roll media fed? Pinch roller against grit roller?
Media is moved by the transport belt. The feeding roller has a motor that feeds media according to the tension readings.

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

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.

53. Is there an air (pressure) core system?
No. The spindle has two pieces, one at each side that fix the core of the roll.

Air core spindles tend to be used only on grand-format printers costing over a quarter of a million dollars.
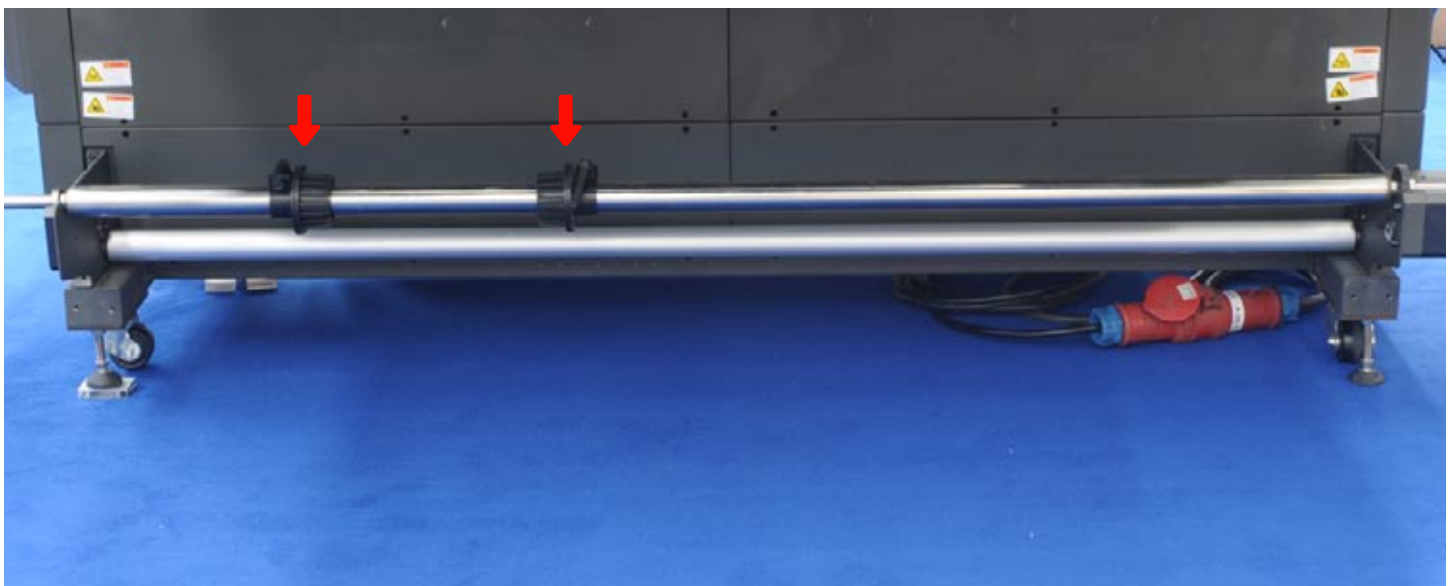
EFI Rastek H650 at FESPA Amsterdam '09. The core of the rolls is gripped by two hubs you can move according to the size and position of your roll.

54. 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?

Yes, there is a tension bar that is in a lower position than the feeding roller.

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

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

The roll-fed mechanism has a system of sensors that read the tension. The feeding roller will feed more media or stop feeding media according to the readings of tension.

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

The roll-fed mechanism comes with the printer.

57. 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).

Yes, all the mechanism for rolls is physically attached to the printer.

Skew is a common downside of a conveyor belt transport system. The reason is because the belts are flexible. To some degree the flexibility is inherent, since most belts are woven material. The heat will also cause the belt to become flexible. These aspects are not specific to only one brand but are one of the pros and cons of the combo transport belt system.

As a result Grapo learned that it is actually more practical to have the media roll out in front of the printer rather than the roll-fed mechanism being bolted to the front of the printer. If the roll-fed system is rigidly affixed to the front of the printer, and has no manner of fine-tuning the position of the feeding rollers, after many months the rolls may not be 100% parallel to the transport belt. By having the roll-fed mechanism free, and movable, you can allow the paper to feed itself in a parallel manner.

This dancer bar moves up and down providing the necessary amount of tension according to the nature of the media.

As you can see, the whole roll-fed mechanism is physically attached to the printer.

Plus, the movable roll-fed unit allows you easily to move your media around and change media (if you have a second roll-fed unit you can simply switch the entire unit rather than having to off-load and on-load a different kind of substrate.

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

As mentioned before, there is a tension bar, but you can feed media directly from the feeding roller onto the transport belt.

59. How do you fasten roll-fed media to the take-up reel?

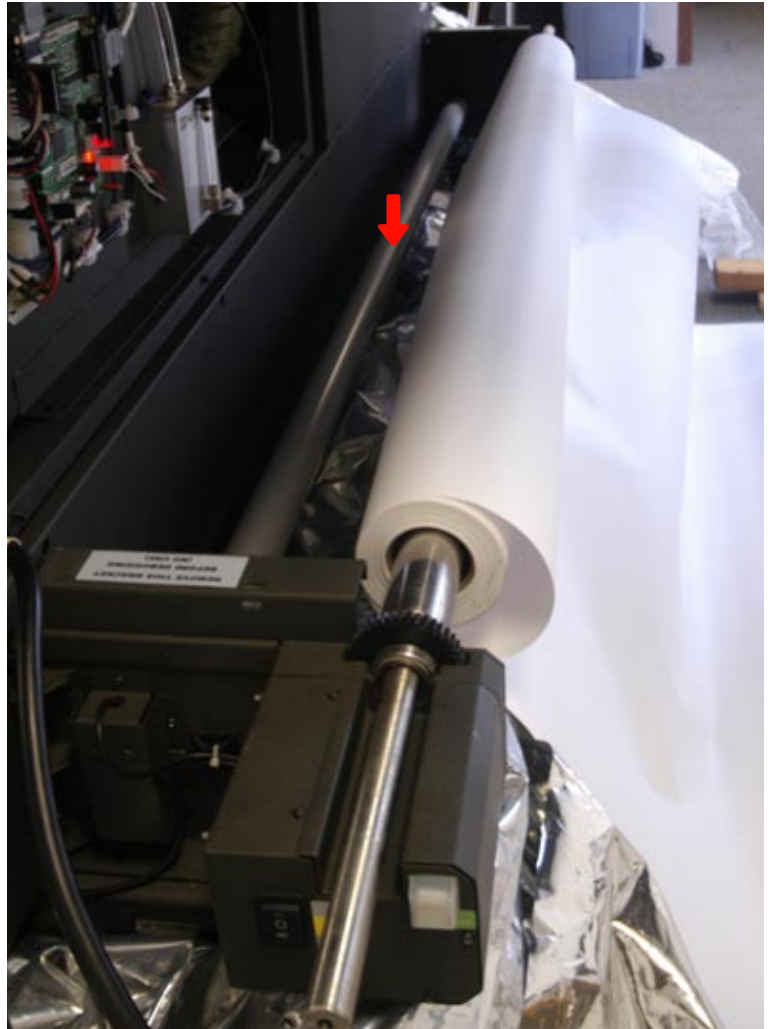You tape media down. This is true in small printers but also in printers such as the big WP Digital RR50 dedicated roll-to-roll printer.

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

Yes, it has its own motor.

61. Is a heavy-duty unwinder-winder system available as an option to handle heavy rolls of materials?

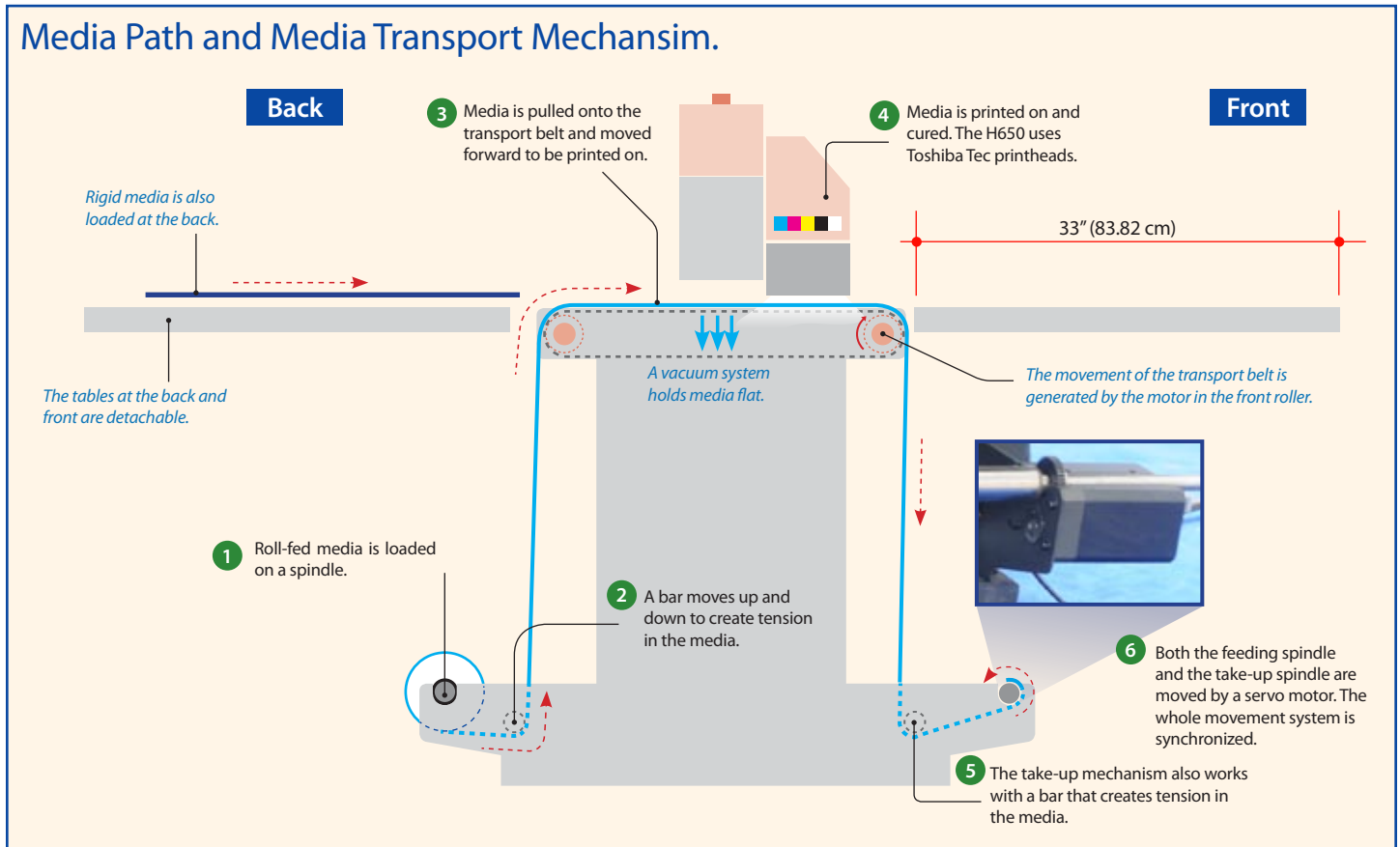Yes, but the printer is not designed to handle heavy rolls of media.

62. 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.

Media Path and Media Transport Mechansim.

Back

3 Media is pulled onto the transport belt and moved forward to be printed on.

4 Media is printed on and cured. The H650 uses Toshiba Tec printheads.

Front

Rigid media is also loaded at the back.

33" (83.82 cm)

The tables at the back and front are detachable.

A vacuum system holds media flat.

The movement of the transport belt is generated by the motor in the front roller.

1 Roll-fed media is loaded on a spindle.

2 A bar moves up and down to create tension in the media.

6 Both the feeding spindle and the take-up spindle are moved by a servo motor. The whole movement system is synchronized.

5 The take-up mechanism also works with a bar that creates tension in the media.

63. Does material roll up evenly?

Once you make sure the media is loaded parallel to the system, you shouldn't have problems with the roll up of the media.

64. How much media is wasted during loading and feeding?

Since the vacuum in the transport belt creates tension in the media, you don´t need to advance media up to the take-up roller; you can start printing in the edge and tape media to the take-up roller afterwards.

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.

The amount of waste also depends on whether you need to attach the leading edge of the media to the take-up spool, or whether you can simply leave the leading edge up on the platen or up on the conveyor transport belt (as is possible on the Grapo Octopus II and some other combo printers).

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.

65. Can you print on more than one roll of substrate simultaneously?

It is physically possible, but Rastek doesn't recommend it for this printer.

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.

66. For handling ink that passes through the weave of fabrics or mesh, is there a trough? Or other mechanism to catch the ink?
There is not a receptacle to receive the ink, but you can use paper below your fabric. You would need a version of mesh that has a layer (liner) underneath.

A trough is possible most easily on a printer with a fixed platen. A trough for mesh or fabrics tends to be present only on a printer costing a quarter of a million dollars or more.

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 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).

67. Is there a cutter? Is it manual or automatic.
No, there is no cutter system.

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.

68. 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

69. Does the printer have leveling supports? How many, and how strong?
The printer has four casters and leveling supports.

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.

70. Does the printer have wheels? How many, and how strong?
Yes, four wheels.

71. Are the leveling supports part of the wheel, or are the wheels and leveling supports separate?
A caster is a structure that incorporates the wheels and the leveling supports, once you wheel the printer to its final position, you lower the leveling supports.

Wheels and leveling supports of the EFI Rastek H650 introduced at FESPA Amsterdam '09. Wheels and leveling supports are separate structures.

72. Do the wheels have a lock on them?
These wheels don't need a lock because the printer rests on the leveling supports, not on the wheels.

For any printer weighing over one ton it is assumed that no locks or brakes are needed on the wheels because a tank will not roll anywhere if parked on a level floor.

ACCESSORY TABLES (front and back) for Combo or Hybrid Flatbed

73. What is the approximate size of the table?
Both the front and rear tables are 71.5" x 33" (181.6 cm x 83.82 cm)

74. Is this table size adequate?
No table for any hybrid or combo flatbed printer is large enough to handle a 4x8' MDO board, so everyone has to jerry-rig an extra table.

75. Are the tables an extra charge, or is the price of two tables included in the original price of the printer?
They are included in the purchase price.

76. What is the design of the take-up table?
        • Horizontal roller bars the full width of the table?
        • Separate flat bars with rows of tiny rollers?
        • Solid flat table with small roller bars?
        • Solid flat table with ball bearings?
        • Another design?
The table is formed by 3 detachable solid planks. Each of these planks has four lines of tiny rollers.

77. Why did your designers select this structure for the tables?
The design of the table is solid and allows both rigid and roll-fed printing, which means you don't have to remove the table to print on roll-fed media.

At the demo room in San Jose, California, the two operators took just about 3 to 5 minutes to put the table.

78. Is the table physically attached to the printer? Or just rolled up close to the printer?
Yes, the table is physically attached to the printer, but you can detach it within a few minutes.

79. Does the table fold up into/onto the printer?
No. You either attach it to the printer or remove it, but it doesn't fold up into the printer.

This photo taken from below the table shows the little rollers that help move media forward.

80. How much weight can the feeder-table or take-up table hold?
These tables hold up to 50 pounds.

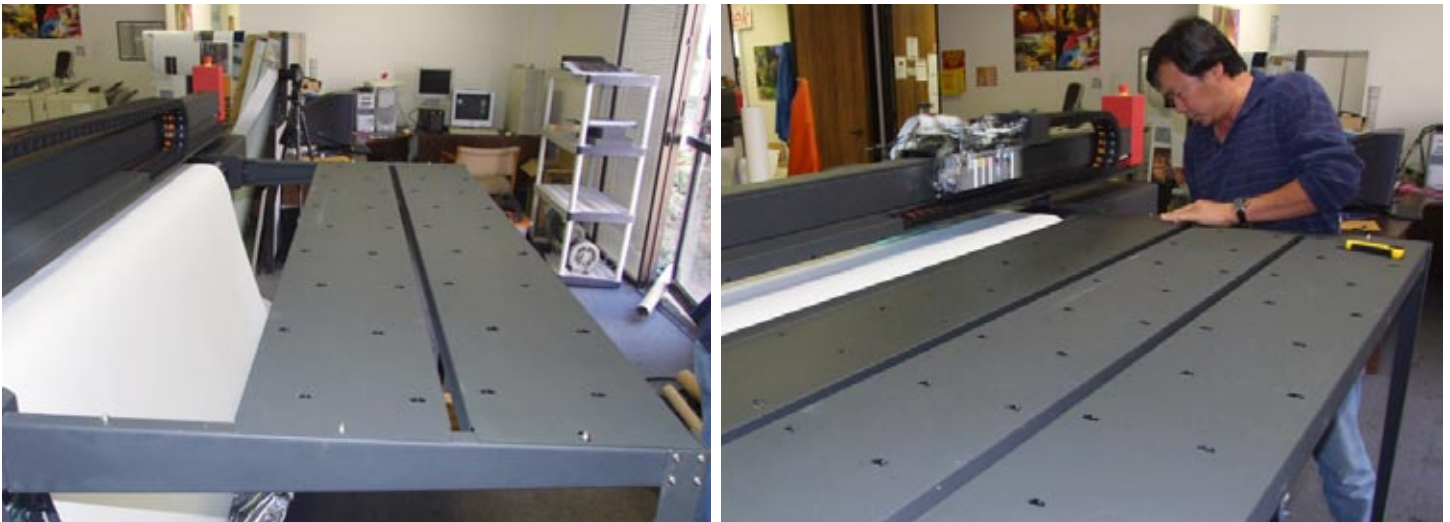### 81. Is there a minimum size for a single rigid board?
There is no minimum, but anything smaller than 10" is not recommended.

82. To change from roll-to-roll to rigid, what do you have to do?
To print rigid media after printing roll-fed, just put the table sections back on.

83. How long does it take to change from roll-to-roll to rigid?
No more than 2 or 3 minutes.

It took a few minutes for the technicians to install the tables. As you can see, the tables are formed by slats that can be easily detached.

UPGRADES, Future Improvements?

84. What features have been added, or changed since the printer first appeared?
The number of electronic boards has been reduced from 7 to 3, so in the event of a failure it is easier to locate the board that is causing problems.

There have also been software upgrades. For example, now you can see in the screen the ink level, which was not an option before.

85. What do end-users ask for; what improvements do owners of this printer wish they had?
As of September 2009 it is too early to know, but keep in mind that an important aspect of the philosophy of the design of this printer is to keep costs down.

Miscellaneous

86. 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?**

Media is moved forwards by the transport belt; the other movement is the printhead carriage.

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.

87. 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, the printhead carriage hovers.

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. This is a decision the operator has to make.

OPERATING THE PRINTER

88. Can the operator manage print jobs via the Internet with this printer?
Yes, you could with XF Fiery RIP.

Normally, the internet-operation feature is not widely developed by RIP manufacturers.

89. 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?
Anyone who has had prior experience with inkjet printers. Anyone can be trained to operate this printer, but prior experience would accelerate the learning process.

90. Is the printer user friendly?
Absolutely, this is the core of the philosophy.

91. What sensors does the printer have?
There is a sensor in each ink bottle that warns of the level of ink; the carriage stops at each end of the bridge because the sensors are activated; if the carriage stops, there is a sensor and the lamps go off; the roll-fed system has a tension sensor.

92. Which materials are pre-established in the software, or do you create the settings for each class of material yourself?
There are no materials pre-established, but the RIP options allow you to create profiles. Your settings will need to change according to your media whiteness.

93. In the main area for operation, is the machine software based (touch screen), or with physical control buttons? Or both?
The Rastek H650 is controlled by a combination of systems. There are physical buttons but some other operations are software-controlled via keyboard and mouse (so not a touch screen system).

The Durst Rho printers are touch-screen operated. The Gandinnovations are keyboard operated. The Fieldcenter Formosa UV printer has many cranks and manual switches. So clearly there are several equally valid ways of operating a printer.

With the Durst Rho current system, everything is on the touch-screen to the point that you almost don't need the keyboard any more. But a full keyboard is available in case you need this for some other function.

The main operations are controlled via software. The PC is not fixed in the printer, which means you can place it in the position that is more convenient to you.

94. Do you get an LCD screen in the printer or other real computer monitor? How big is the screen or monitor?
Yes, you get a PC with the printer. The LCD screen is 17".

95. Is the position of the LCD screen or monitor user-adaptable?
Since the whole PC is not attached in the printer, you can put the monitor in whatever position you prefer.

96. Where does the computer keyboard sit?
It is up to you, since again, the PC is not physically attached to the printer.

97. Where does the operator stand or sit?
At the right.

98. What aspects of the printer can you operate from behind (the loading area)?
You feed media at the back and the ink bottles are also located at the back.

99. What controls are on either end?
Emergency buttons, at the right you find the area of valves to control the vacuum sections.

100. Is a foot pedal included (for operating aspects of the printer)?
Yes, it is included. The pedal turns the vacuum on and off.

101. Can you do unattended printing? For how long? How about overnight?
This is not recommended by EFI Rastek for this printer.

102. How many operators or operator assistants does this printer require?
Normally one is enough, although with two it is faster to attach the table for example.
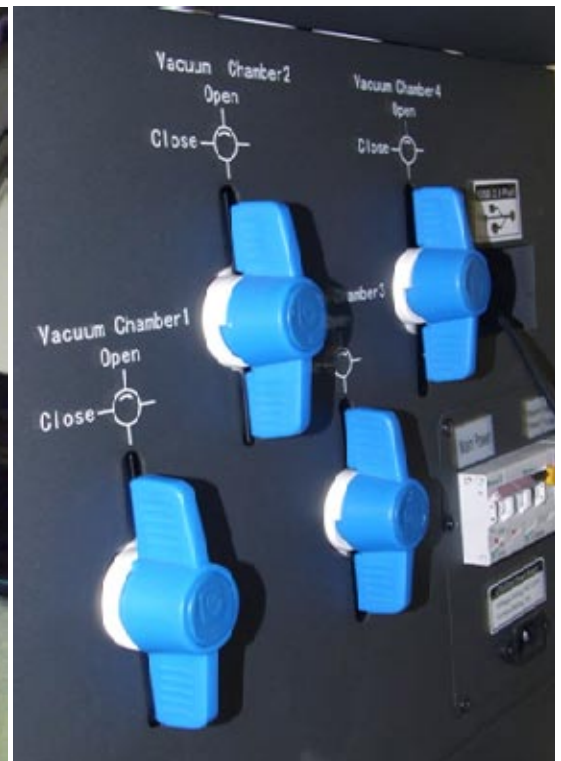
The only controls at the sides are the emergency stop buttons and the valves that control the vacuum sections.

CONSTRUCTION (BUILD QUALITY)

103. When designed, what is the life-span that each part is tested for?
3 to 5 years but it depends; it is not the same time for all parts. Ink filters need to be changed periodically.

For many manufacturers, parts life-span is a new concept, especially when the cost of the printer needs to be kept down. But if the EU requires a guaranteed parts life-span, this will impact Chinese printer manufacturers in particular.

104. What kind of testing is done in the factory of the incoming parts?
There is an EFI person to inspect the quality of the incoming parts in the factory in China.

105. What is the solid-ness of the construction of the outer body? Is it plastic? Metal? Heavy gauge?
This is a very solid machine. It can run 8 hours a day.

106. Is there a hood?
There is not a hood for the printer but the printheads and UV lamps are enclosed. You can open up the printhead carriage hood to operate aspects of the printheads.

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. Yet in the real world most printshops run their printers with the hoods completely off (or opened).

107. How would you describe the overall workmanship of visible parts? Clean (Swiss made), or flimsy and uneven (several Chinese-made printers)?
It is solid and clean. This is an industrial-looking printer.

The outer parts are made of solid metal. The printer, although small, looks very sturdy.

SET-UP OF THE PRINTER: PRACTICAL CONSIDERATIONS

108. What is the delivery time, between the time I order the printer and it is delivered?
30 days. There are two main points of distribution: one in California and the other in Amsterdam.

109. What are the electrical requirements of this printer? This means, will the building have to be rewired.
200-240 VAC, single phase, 50/60Hz, 30 Amps maximum.

110. Do you need to budget installing a ventilation or room exhaust system?
The spec sheet reads it is not necessary an additional ventilation system if your facilities already have a standard office ventilation already installed.

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).

EFI Rastek H650 at FESPA Amsterdam '09. Health regulations are particularly strong in Europe, but no exhaust system was required by the printer in this trade show. Other printers of a more industrial size, WP Digital, HP, or Durst did have exhaust pipes installed.

111. Are there any special temperature or humidity requirements or preferences of this printing system?
The temperature range recommended is 65º to 80º Fahrenheit (18.3 to 26.6 Celsius). The ideal temperature is 72º Fahrenheit. The humidity recommended is 30% to 80% (non condensing).

Temperature and humidity are indeed crucial, especially humidity. Even more important is that whatever temperature and humidity is present in the work area, that it not vary during the day: cool in morning, hot by 11 am. Hotter by 2 pm.

112. What about altitude? Some cities such as Guatemala City are at a high altitude?
EFI Rastek have not received complaints of issues due to altitude so far.

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.

113. What about dust and cleanliness of the air?
A dust-free environment is recommended for optimal operation.

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.

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

115. What air pressure is required to be provided to the printer? Is this for a vacuum table, or other purposes (such as ventilation)?
There is no need for an external source of air pressure.

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

Width	Depth	Height	Total Weight
121.5" (308.61cm)	40" (101.60cm) without tables	52" (132.08cm)	1000 lbs. (453.6 kg)

INSTALLATION OF THE PRINTER

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

118. Does the printer have lifting hooks on the top, or elsewhere?
The printer has a flat surface below, so it is easier to place the prongs of the forklift truck.

119. What size and kind of forklift truck do you need? Or do you need a crane?
You need a forklift truck capable of lifting more than 1000 pounds, because to the weight of the printer, you have to add the weight of the crate.

120. Does the printer have spaces for the forks of a forklift truck to get a balanced hold on the bottom of the printer?
Most sophisticated UV printers of most brands have rectangular brackets built into the underside of the printer, usually both front and back, so you can use a forklift truck.

121. Can you install this printer yourself?
This is not recommended. You need the assistance of a factory-trained technician.

122. Is installation included in the purchase price?
Policies on this aspect vary from one distributor to another.

123. How many people come for the installation?
One person.

This is the fork-lift truck used at the headquarters in San Jose to move the crates used to ship the printer.

124. How many people are required to lift, move… the printer during installation? How many people do you need to provide for the installation?
One or two would be enough.

125. 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?
The dealer sends a site prep guide.

INSTALLATION OF THE PRINTER: INSTRUCTIONS & MANUALS

126. How many manuals are available?
EFI Rastek has a preliminary manual that is being developed.

127. Which manuals are hard-copy? Which manuals are only on CD?
Everything is digital. There is no version in hard copy.

128. Is there a Site Preparation Guide? If so, is it helpful?
Yes.

129. Is there a Service Manual?
Yes, there is a Service Manual but this is only for the tech-support personnel.

130. What is the native language of these guides? Is the translation acceptable?
The original is being written in the US in English, but EFI Rastek has a plan to produce it in 5 languages: French, Italian, German, Spanish, and English.

The following statement is as valid for a $400,000 UV printer as it is for a $70,000 model. No matter how well translated, all translations done by a speaker for whom English is a second or third language should have the translation proof-read by a native English speaker. If a company is selling printers into the US, the translation needs to be fully and completely comparable to spoken English, not literal English.

The User's Manual is still being edited. This is the cover of the preliminary document.

90% of the manuals whose native language is other than English use terms that are too literal: they are translated terms, not the actual terms that anyone in America would use. This is a polite way to say, that every manual should be read by a native English speaker who is familiar with the jargon of UV printers.

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

131. 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.

TRAINING

132. Is training included in the purchase price? If so, what kind of training is offered?
Yes it is included. It is provided by the dealer.

133. 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).

134. Is factory training available?
Yes, there is a building next to EFI Rastek offices in San Jose, CA, where people can be trained.

135. What on-line training is available?
This is not available at the moment.

Fewer than 5% of the UV printer manufacturers offer on-line training.

136. What about follow-up training after you have had the printer a month and know enough to ask better questions?
Yes, it is also provided by the dealer.

137. 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)?
This depends on the distributor you're dealing with.

138. Between the day the printer arrives, how soon is it realistic to achieve full productivity?
The printer can be running in two days; operators can learn the tips and techniques within a week. Before 30 days the operator can run the printer from 8am to 5pm.

If a printer is mature (and out of beta stage) you can achieve full productivity within a week or month. But many owners have told me quite frankly, that it took them several months to achieve full productivity (especially owners of the Luscher JetPrint). The longest time before a printer is really productive is when a printer is still in beta stage when you buy it. It takes a while for the firmware and hardware to be improved and updated.

After speaking with many different printshop owners, what I am learning is that if the printer is cheap and junky you will have constant down time due to the printer breaking down (reports from owners of Infiniti UV printer). If the printer is expensive and complex, it takes longer to understand everything and achieve full productivity. And when an expensive and complex printer does break down, it takes longer to repair.

TECH SUPPORT & WARRANTY

139. What is the original warranty period?
One year.

The normal original warranty period is one year but Gerber has had a special offer of "second year free if you buy before such-and-such a date.

140. How does this warranty period compare to warranties of comparable printers?
Most manufacturers offer warranty for one year.

Roland also now offers a two year warranty but this is because they want to sell you Roland branded ink and Roland branded substrates. They can only sell you these higher priced consumables if they provide a free warranty. If you do not use Roland ink, the warranty is voided anyway. But there are not really any or many UV printer manufacturers who sell their own branded media, so there is no reason for a UV printer manufacturer to offer more than a one year warranty.

In the past Grapo offered a two-year warranty. That is because their UV printers are relatively simple (in a positive sense, meaning less to break down).

141. Does it include parts, labor, printheads?
No, this warranty does not cover printheads nor consumables. Printheads are covered the first 90 days, which is about three months. Other companies cover the printheads for 6 months. Others don't cover the printheads at all.

142. Is there an extended hardware warranty? What price?
Yes, a second period can be bought for $7,000 each year.

143. 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…)?
Rastek technicians know this printer inside out. Tech-support personnel is factory-trained.

144. For how many months is tech support offered? Is this the entire period of the warranty.
For as long you have the printer.

145. 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.
8am to 5pm. Tech-support is offered 12 hours a day because there are offices in different time-zone locations in the United States, plus the office in Amsterdam.

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

147. What is the native language of the tech support person?
Depends on the location of your dealer. As explained earlier, there are distributors in many regions around the world.

148. Who does repairs? Dealer, manufacturer, distributor, or third-party?
The dealer.

149. Do spare parts come from another country? If so, what is the wait time?
Spare parts are stocked in California and in Amsterdam.

CLEANING & MAINTENANCE NEEDS

150. How easy is it to access the area where you have to clean the heads?
The cleaning procedure is designed so that you don't need to access the area of the printhead nozzles.

151. How is head cleaning accomplished? purge, suction, manual, other?
There is a vacuum system to clean the printheads, so it is by suction.

152. To what degree is purging automatic (once you press a button), and to what degree is it manual?
You purge by pressing a button.

153. 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?
At the front left.

154. How many levels (strengths) of printhead cleaning (purging and/or sucking) can be accomplished via the firmware (software)?
There is only one level.

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

156. Is purging done with ink, or with a flush solution?
Purging is done with ink.

The area of the printheads is easily accessible once you open the hood of the carriage; however, there is a suction system so that you don't have to touch the printheads.

157. 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 less expensive printers you have to inject the flush with a syringe by hand.

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

The cleaning system was designed so that you can purge:
- CMYK only,
- W only, or
- CMYK and W.

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

It goes to a waste bottle located at the back. It is a 4-liter container and you should check it every week.

These are the valves to control which ink lines are going to be purged.

You start the purging procedure by pushing a button (c). Then, ink that is purged from the printheads is collected by a tray (d) and finally goes to the waste bottle (right photo) located at the back.

160. Is there a vacuum suck cleaning system, like a traditional vacuum cleaner?
Yes, cleaning of the heads is done by a vacuum system.

161. Where is the parking area, "home?"
At left.

162. Is the service area the same as the parking area?
Yes, at the left.

163. Does this printer spit, or "weep" ("flash") ink at regular intervals?
Not by default but you can set that in the software.

Solvent inkjet printers spit ink at the end of every pass in order to keep all printhead nozzles open. The reason is that if you are printing a banner with an area of pure cyan, then the other printheads will not be jetting ink (since their colors are not called for). In theory these nozzles will clog while not being used. So spitting allows all nozzles to eject ink occasionally.

Another way to allow all nozzles to squirt ink periodically is to have a band of CMYK or a band of six colors (CMYK light Cyan light Magenta) at one or both edges of the image, immediately outside the image area. This pattern causes every color to jet even if these colors are not being printed in the image itself.

Although most UV printers do not require a band of printable colors along the edge, many UV printer manufacturers do recommend spitting. However some UV printers do not have a spitting capability.

164. Does the manufacturer provide any special cleaning tools?
Yes, the manufacturer provides a basic set. Gloves, goggles and other elements are included.

165. Does the printer itself have a wiper (a blade)?
As mentioned before, printheads are cleaned by a vacuum system. It is not recommended to physically touch the nozzle area of the Toshiba Tec printheads.

MAINTENANCE

166. What daily procedure is required at start up in the morning?
You turn the machine on, purge once and clean the heads with the vacuum system.

167. What daily maintenance is required at night?
You just leave the printhead vacuum system on.

168. What other periodic maintenance is required by the operator?
Nothing complex. Once a year you will need to grease some parts.

169. How often do filters have to be checked? Cleaned? Changed?
The ink filters need to be changed every one or two years. The small filters need to be changed every 6 months.

170. How expensive is replacement of the filters?
The big filters are around $100; the small filters are around $5 to $10.

171. How do you clean the transport belt?
You can wipe it with alcohol. You can scrape ink off.

These are the ink filters that need to be changed more constantly.

172. What part(s) of this printer need the most attention to avoid breakdown?
Printheads and lamp bulbs.

173. What maintenance do the UV lamps require, such as cleaning the quartz?
Cleaning the quartz and replacing the bulbs every 6 months.

174. What self-maintenance does the printer do on its own?
There is no self-maintenance system at the moment.

175. What is the most delicate, or complex, or time-consuming cleaning or maintenance chore?
The most time-consuming chore is probably to clean the belt.

Printhead nozzle plates are fragile. Some manufacturers say never to wipe the actual nozzle plate by touching it. Other manufacturers requite that you physically wipe the nozzle plate with a swab. A few manufacturers are unsure and change their recommendations. But no matter that model printer or what model printhead, I would list printhead cleaning as delicate.

176. What areas of maintenance are hard to access or hard to accomplish?
The printhead area tends to be the most difficult area to access, but the H650 was designed with a vacuum cleaning system, so you don't really need to access the printhead area.

177. How much time, media, and ink are used during regular cleaning, calibration, and maintenance?
Not much. Generally you use up half a millimeter of each color of ink.

178. What is the average number of maintenance calls per printer per year?
One infamous UV printer reportedly had an average of 52 service calls per year.

179. Is there a sleep mode? Should the machine ever be turned off? At night, how much do you turn off? Does this entail having a UPS unit to guarantee it is on all the time?
Yes. If you turn off the printer, only the vacuum system for the negative pressure in the printheads stays on.

Although the printhead area tends to be the most difficult area to access, there is not much you need to do since the cleaning is done by a suction system (not manually). The technician is working in the printhead area to finish installation of this model.

180. 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.

181. How should a printer be prepared for sitting unused for a long time?
Let the ink out of the system, flush all the ink lines, remove the water from the printhead system.

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

182. 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.

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

184. Have you employed an emergency stop yet?
Since these notes were taken at EFI-Rastek building, the answer is yes; the techs have used the emergency stop buttons because they make sure all mechanisms work properly. But we would need to ask an end-user how many times he has been in need to use the emergency stops.

Eventually you would need to use the emergency buttons, especially if you have a head crash.
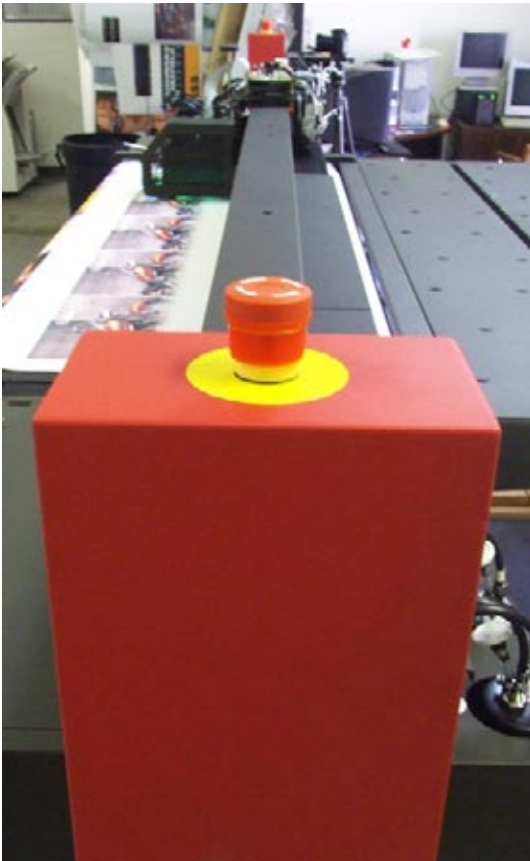
There is an emergency stop button at each end.

185. Is there auto-shut down if the operator sticks their hand into the system while it's operating?
If, for any reason the printhead carriage stops, the lamps go off.

186. 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?
Depends on how sensitive you are. In general, the bigger the room, the fewer odors you perceive.

A hood is most commonly seen on industrial printers whose odor emissions are considerably higher than small printers like the EFI Rastek H650.

All ink emits odor (even water-based), but if you ventilate the printer and the work area the smell is manageable, for most UV inks. However one or two UV inks have a reputation for a smelly chemistry. So be sure that the printer you have on your short list has an ink that passes the sniff-test.

187. Is the machine enclosed, or exposed?
This is an exposed printer.

188. What is the noise level, primarily of the fans for the vacuum?
The only two sources of noise are the vacuum pump and the shutters. But hums and clicks are not unbearable like other really noisy machines. Rak Kumar tells jokingly that some end-users say the clicks of the shutters are the sound of money.

Normally the vacuum pump is the nosiest part of any UV-curable flatbed or combo-style printer. Roll-to-roll UV printers do not need as much vacuum table area so are not as noisy in this respect.

189. Do the printer specs list the noise level?
No. The noise level is not listed but again, the noise produced by this printer is very low. I could continue to talk normally with the technician while the printer was running.

190. What moving parts might hit a person if they are standing near the printer?
The only thing that could hit you is the printhead carriage, but its movement occurs only within the print zone.

191. Are any other safety or health issues involved? Does the operator need to be concerned with any other safety precautions?
It is not recommended to wear apparel printed on with UV inks, because this type of ink (all UV ink in general, not only the brand used by Rastek) is not good for your skin.

The other aspect is the UV light. EFI Rastek recommends wearing goggles when operating the printer, but in the practice, only few operators will use eye protection on a daily basis.

192. How easy is it to obtain the MSDS of the ink?
They are online.

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.

193. Does the ink used in this printer contain chemicals suspected of causing cancer? Does the ink in this printer contain chemicals that may cause problems with genes?
And the other question, for using UV ink in the EU, is whether any chemicals in the UV ink in the printer that you have selected is prohibited for certain uses (such as for wallpaper). These are questions you need to ask a chemist since most people in the trade show booth may not know the answers. And merely reading the MSDS (which is usually a challenge to obtain in any event) is not much help unless the pros and cons of each chemical are clearly expressed.

194. How is the UV light shielded so it does not burn the eyes of the operator? Does the operator have to wear safety glasses?
The printhead carriage has a covering that shields the UV light partially.

The tables of Oce, Mimaki, and some other flatbeds are bright polished metal (aluminum?). So you have an almost mirror-like surface directly below your UV lamps.

PRINTHEAD TECHNOLOGY

195. Which brand printhead is used?
Toshiba Tec.

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.

196. Which model of printhead is used
CA-4 but EFI-Rastek will change these printheads for a more recent model of Toshiba Tec.

197. Is the printhead identified in the spec sheet brochure by brand or also by model, or not at all?
No, the spec sheet does not mention brand or model.

198. Is only the printhead used by itself, or is an entire electronic assembly also from the printhead manufacturer?
Some of the electronics are manufactured by Toshiba.

199. Is this a printhead adapted from solvent ink or a new design made especially for UV ink chemistry?
This printer was designed from the ground up to handle UV or oil-based inks.
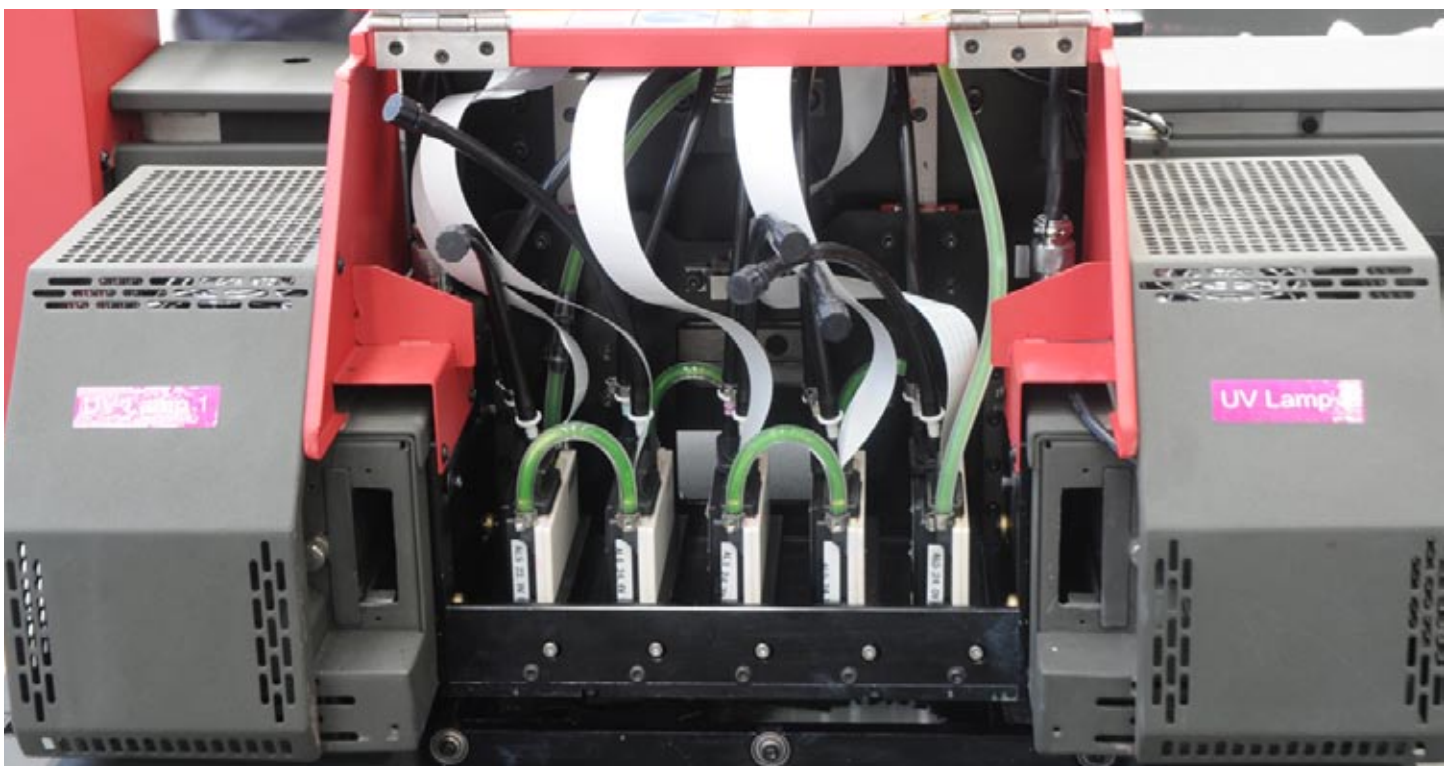
Toshiba Tec CA-4 printheads. This model has a CMYK+W configuration.

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

These printheads are also used by
- Oce Arizona UV flatbeds
- Screen Truepress Jet650UV, Jet2500UV,
- Lotte InnoJet UV900,
- Flora F1 180UV,

Some early models of the Oce Arizona 250 had issues with their printheads but the newer Oce Arizona 350 use an improved model of the printheads.

201. What are the benefits of this printhead?

These printheads are known to produce high quality images. This is because the printhead offers variable drop sizes depending on the brightness of the colors. The lighter the colors, the smaller the drop size. Likewise, the darker the colors, the bigger the drop size. This selection of drop sizes happens automatically.

202. What are the downsides of this printhead?

The Toshiba Tec heads have a reputation (at least on the Oce printers) of being slow.

203. How many nozzles per printhead?

318

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

There is no sensor for this purpose. You can do a nozzle print every morning to detect clogged nozzles.
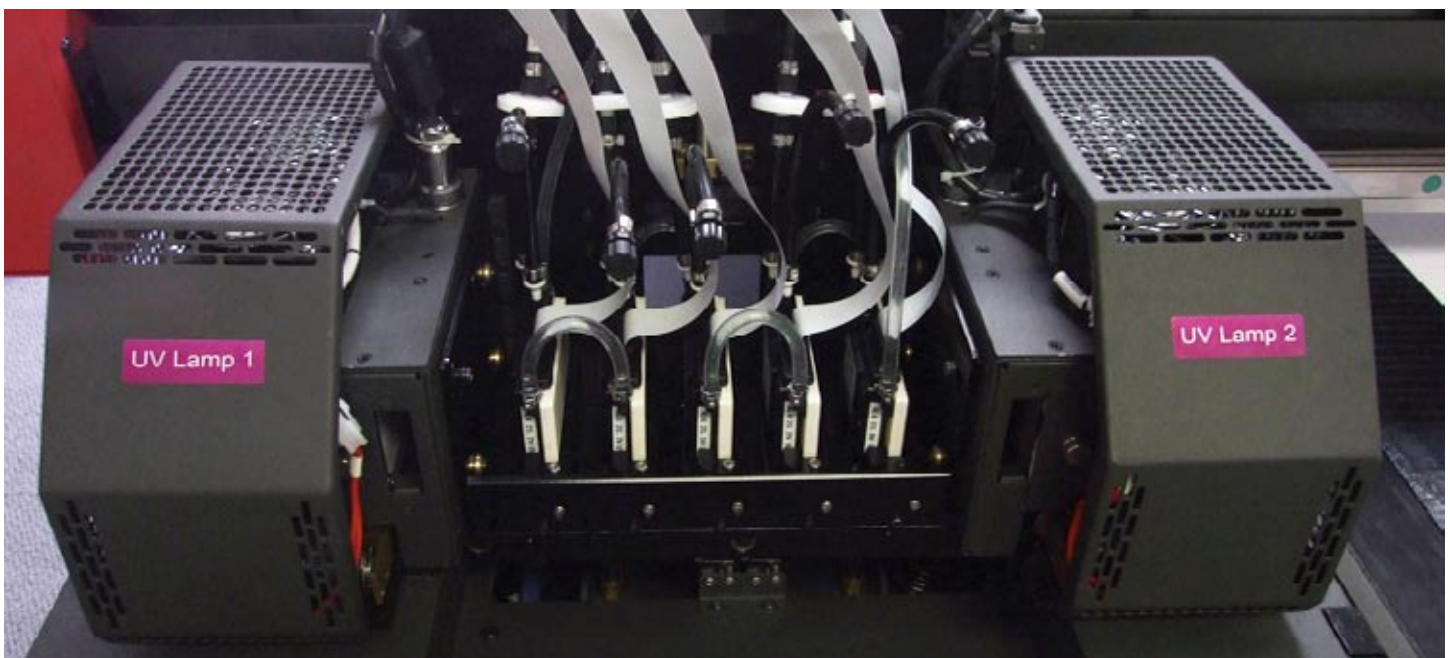
205. How many printheads per color?

1 printhead per color.

206. How many total number of printheads?

Four or five, depending on whether you select white in your ink configuration.

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

Printheads are aligned to the others.

There is one printhead per color. This is one of the differences between the H650 and the H700, which has two heads per color.

208. 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?
There is only one printhead for white.

209. Is the printhead for the white ink the same model as the printhead for the other colors?
In the beginning, DuPont tried to use a printhead for the white ink that had a larger droplet size. However gradually they switched to using all the same model printheads. The reason a larger drop size for white ink is a good idea is because otherwise you need two printheads in order to make the white ink opaque enough. But it turns out you need two printheads for white ink anyway, so that you can jet down a flood coat of white before the rest of the colors (when printing on transparent or translucent materials).

Nowadays almost all printer manufacturers use the same printheads for white that they use for colors. What is different is that the ink tanks for white require a method of agitation so that the pigments of Titanium dioxide don't settle out.

The only instance that I have heard of recently where a new UV printer is designed with special heads for white ink is where the newest L&P Virtu uses Spectra M Class heads which are MEMS technology. These are not yet appropriate for using with white ink, so a different model head is used just for the white.

PRINTHEAD DPI & Features

210. What is the drop size in picoliters?
6pl to 42pl.

211. Is there variable droplet capability?
Yes. This as mentioned before, the drop sizes will vary from 6pl to 42pl depending on the brightness of the colors in your image.

212. 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?
The advertised DPI is 1200x900, but because of production speeds, most end-users use 600x600 DPI.

### 213. How many passes can this printer achieve?
Up to 16 passes.

The lower the number of passes, the faster the printer prints, but the lower the quality. At a printer's fastest rated speed, the output is usually unusable for most applications other than distant viewing for a billboard or banner. To achieve viewing quality for Point of Purchase or an honest photo quality, you generally need to set the number of passes at the highest number (which results in the slowest speed).

214. 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.
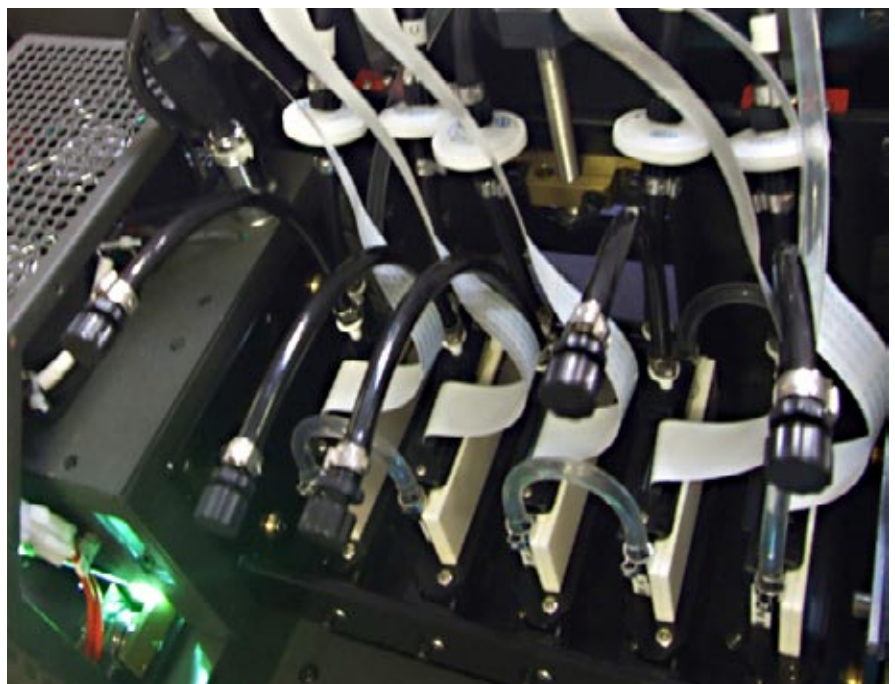
One of the key advantages of these printheads is the ability to jet multiple drop sizes which produce a wider range of grayscale.

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 print-heads).

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.

215. If modes, what are the modes called?
The print modes are called
- **High Quality Mode:** 600dpi, four gray levels. Print speed is 72 ft^2 (6.03m^2) per hour.
- **Production Mode:** 600dpi, four gray levels. Print speed is 135 ft^2 (11.14m^2) per hour.
- **Billboard Mode:** 600x300dpi four gray levels. Print speed is 250 ft^2 (21.36m^2) per hour.

216. Are the passes identified for the modes?
Yes, the number of passes is related to the print modes:

- **High Quality Mode:** 16 pass
- **Production Mode:** 8 pass
- **Billboard Mode:** 4 pass
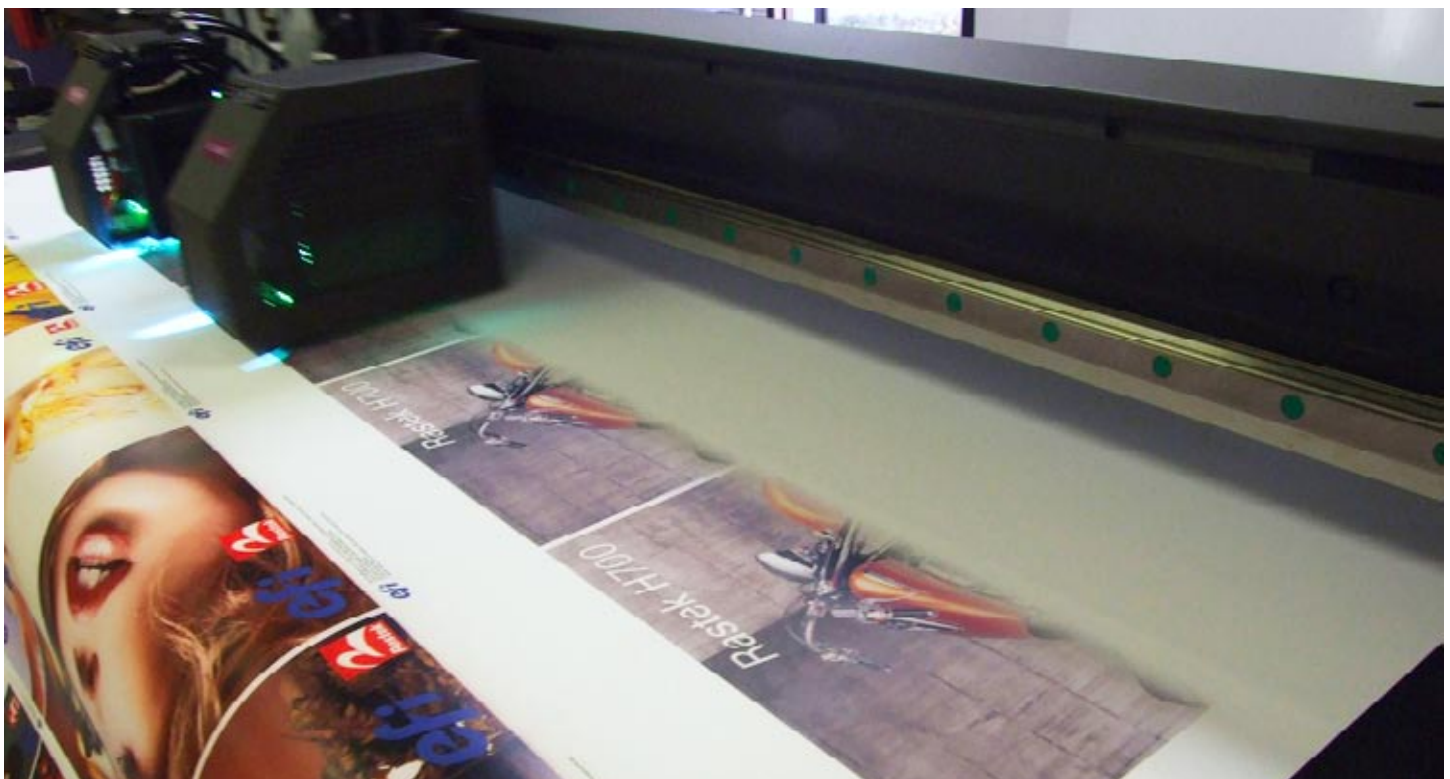
When choosing your printing modes keep in mind that the higher the quality, the slower the machine prints and vice versa.

Bi-DIRECTIONAL VS Uni-DIRECTIONAL PRINTING

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

218. Is the sequence of ink color laydown the same coming and going? (rare). Or is the sequence of colors bi-direction-ally a different sequence than uni-directional? (the usual way).
The sequence is not the same coming and going because there is only one printhead per color. On systems where there are two or more printheads per color you can have the printheads in a mirrored position, for example CMYK-KYMC so that the sequence is the same coming and going.

219. 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?

Yes. The ink is fired at 8 m/s in a vertical direction. If you add the speed of the carriage which is in a horizontal direction; this vector makes the drop of ink fall in a diagonal direction.

220. Is printing bi-directional or uni-directional?

The printer can be set to print bi- or uni-directional. But bi-directional is the most used.

221. What are the different results in speed; in quality?

Uni-directional decreases speed by 35%.

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

Everything is printed at bi-directional setting, except in media that has different heights, like a door.

223. Which materials can be printed fast at 2-pass or 4-pass modes?

The number of passes needed may also depend on how worn the printheads are. If the printheads are old you may need more passes than when the printheads are new.

PRINTHEAD Positioning

224. What is the position of the printheads relative to the media? Above, jetting down (the common position) or alongside, jetting horizontally (rare)?

Above, jetting down.

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

They are placed in a straight row.

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.

226. How wide is the path of a printhead, or the carriage full, for a single pass (one movement from right to left, or left to right (but not both together)?

53.6mm is the printable width per printhead.

227. Do you raise the heads manually, with click stops, or motorized?

Manually, with a knob that is on top of the printhead carriage.

228. How complex is the procedure to align the printheads? When you add a new head, how long does it take to align it?

First you align the black and then align the others based in the black.

The HP spec sheet is helpful in alerting you to the reality of aligning their X2 MEMS printhead when you need to replace a failed head with a new one: 45 minutes. Even if this honest estimate was not provided in the spec sheet, it would be ascertainable sooner or later anyway. I commend HP for being ethical in listing this aspect of maintenance.

Printheads are aligned in a straight row.

229. Is there an alarm system to stop the head from hitting substrate if head is not high enough?
Not at the moment.

230. How is the nozzle plate protected? Is it recessed?
Yes it is recessed and there is a rim around each printhead opening.

PRINTHEAD: Associated Features

231. Is ink heated in a buffer or elsewhere before arriving near the printhead?
The ink is heated 35° to 40°.

232. Is there a heater associated with each printhead?
The print head assembly of the H650 printer includes a heating system to precisely control the temperature for the print heads. The heating system incorporates a series of poly lines that flow heated fluid from head to head, until a mean temperature is achieved for the head assembly.

233. 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. Today GRAPO is perhaps the only 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). GRAPO has plenty of experience since they are themselves a signage printshop, so they would not use any system that was not successful.

234. How is the ink heated? Heater, or hot water?
Ink is heated with hot water.

235. Does any other part of the printer have heat, such as the platen?
This is not needed for UV ink.

236. What is the firing frequency (voltage) of the printheads (in KHz)?
This depends on the drop size. If your drop size is 6pl, the firing frequency will be 13 KHz; if your drop size is 42pl, it will be 7.2 KHz.

237. Can the firing frequency be varied by the end-user?
No.

238. Is negative pressure required to maintain the ink (without the ink dripping out the printhead when the machine is turned off)?
Yes. The vacuum system that stays on when the printer is turned off is to keep ink inside the printheads.

239. Is the negative pressure user variable?
Yes. There is a small knob to control the negative pressure.

240. How is air eliminated from the ink lines or from the printheads?
There is a secondary inlet in the printheads to eliminate air.

241. 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?
Rak Kumar comments that the printhead selection locks you into 40% of the design of the machine.

242. Do you need to tell the printer where to start printing?
Yes. You can fix the X position.

PRINTHEAD Life Expectancy

243. What is true life expectancy of this print head?
You would need to replace one head per year. The life of a printhead is directly affected by head strikes, and quality of maintenance. These are the most common causes of printhead failure.

244. Is the printhead considered a consumable?
Yes, but the printheads are covered the first 3 months by the warranty.

245. If this piezo head fails, who is responsible for paying for replacement heads?
The customer. Many companies have had experiences with end-users that do poor maintenance to the printheads and complain later. If a printhead doesn't fail the first 2 or 3 months chances are that failure is due to inadequate maintenance.

246. Is there a limit to the number of printhead failures that are covered over a unit of limited time?
There is no limit. But printheads are covered by the warranty only for the first 90 days.

PRINTHEAD CARRIAGE and GANTRY

247. Describe the design and construction of the carriage area?
Rak Kumar has many years of managing wide-format printer companies, so he knows all the design aspects of a printer. If you wish to learn some of the jargon and design features of a UV-curable printer yourself, it is worth visiting the booth where he exhibits (generally the booth of EFI).

248. Where are all the electronics situated? Above the heads, behind the heads? On the back side of the carriage?
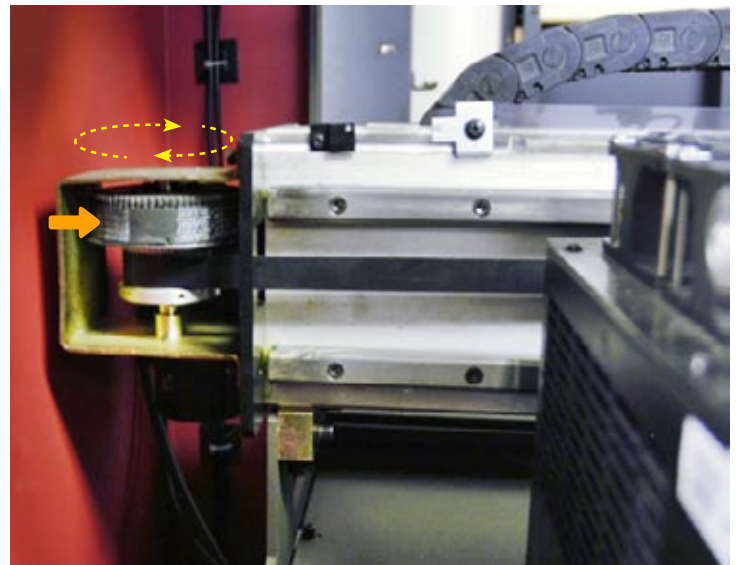Right on top of the printhead carriage.

249. What moves the carriage?
A servo motor made by Fuji. This motor is smaller than the one that moves the transport belt.

250. Describe the encoder strip?
The encoder strip is 150 dpi.

The movement of the printhead carriage is generated by a servo motor.

SUBSTRATES

251. Can this printer handle rigid material only, or roll-to-roll only, or both interchangeably?
Both interchangeably. This is the advantage of a combo printer. For example, on a hybrid printer, media is moved by pinch rollers and you can print on both rigid and flexible media, but rigid media tends to cause problems because pinch rollers are not the best mechanism to move heavy boards or small pieces like ceramic tiles.

252. What sizes of material can be printed on?
You can print on both rigid and roll-fed media up to 65" (165 cm) wide.

253. What is the difference between media width and actual print width?
The difference is an inch.

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
64"	65"	EFI Rastek H650

254. What about edge-to-edge printing (borderless)?
Yes it is possible for media under the 64".

255. Can you adjust the rate of media feed?
Yes, it is possible.

You need to adjust the rate of feed to remove banding lines caused by media feed that is slightly off. This is not entirely the fault of the printer but a result of the fact that each different kind of material feeds slightly differently.

256. Can you adjust carriage speed?
The carriage speed depends on the print mode selected.

LOADING MEDIA

257. How about maximum roll diameter or weight?
9 inches (22.86 cm).

258. What about minimum size that can either be loaded or handled by the system?
There is no minimum, but anything smaller than 10" is not recommended.

259. What thickness can this printer handle?
You can print media up to 1.8 inches (4.572 cm) thick.

260. 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").

There is a gap measuring tool that you can slide across the printhead carriage to determine whether your height is adequate.
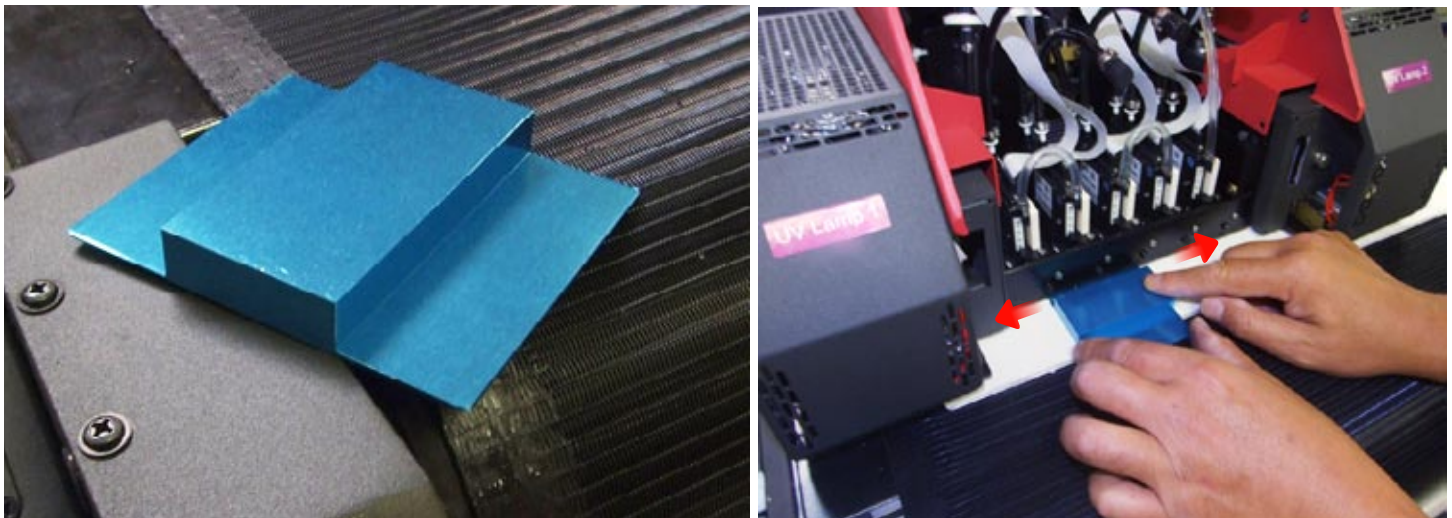

This is the measuring tool you use to check if the printhead carriage is at a proper height.

261. Is roll-fed media loaded from the rear, top, or front?
Roll-fed and rigid media are fed at the back.

262. 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.
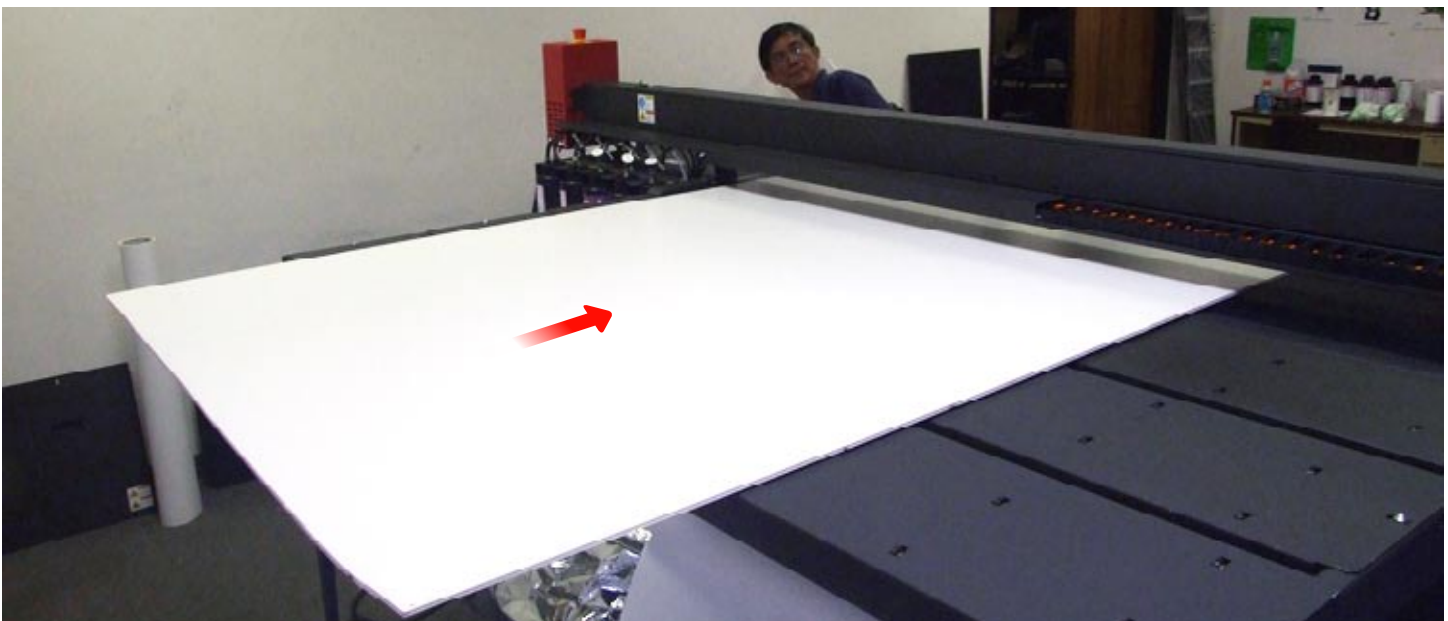
As explained earlier, both roll-fed and rigid media are fed from the back.

SUBSTRATES, Materials, Applications, and Issues

263. What materials does the manufacturer list?

According to the manual, media types include, but are not limited to:

- Foamcore
- PVC
- Styrene
- Corrugated plastic
- Plywood
- MDO
- MDF
- Aluminum
- Plastic composite,
- Cardboard
- Paper
- Acrylic
- Plexiglas.

264. What materials can this printer print on perfectly?

Vinyl, paper, coroplast, syntra and others.

265. What materials can this printer print on okay?

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

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

Signage materials such as foamcore, styrene, vinyl, etc can be perfectly printed on with the EFI Rastek H650.

For glass and acrylic you would need a primer, or corona treatment, or other pre-treatment method. In general, media with different heights tends to be difficult. MDO boards are large and heavy, and even large quarter-million dollar printers tend to have skew issues with MDO boards.

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

Teflon is not recommended.

268. Can you print on mirrors?

It is possible but not recommended.

269. What feeding issues are there with some materials?

The only problem would be if media is warped, in which case the vacuum does not hold flat the media and this could cause problems like head crashes or poor image quality.

270. 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?

Thin film or paper-thin styrene would have issues due to exposure to heat.

Heat sensitive materials for mercury arc UV lamps would include polyethylene, polypropylene, shrink-wrap, very thin and thermal sensitive papers, plastic coated cartons, PVC and aluminum foil (www.dotprint.com/fgen/prod1297.htm).

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

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

You can in effect lower the heat that reaches the material by raising the entire printhead carriage. However this results in noticeably less quality (because the ink is flying through the air a longer distance while the material is moving away from it). You can also set the printhead carriage to move further away from the printing area at the end of each pass (in those cases that the media is less than the maximum and in those cases where these settings are facilitated by the printer design and firmware).

One way to dissipate heat is to have good ventilation drawing the hot air up and out of the enclosed printer. There are two exhaust tubes at the top for this purpose. These are not only to suck out the odor and ink mist, but to remove some of the heat too.

271. 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.

One economical way to get rid of some static is to use a fabric softener – Downy-for example, which you can get from the supermarket. But be sure to learn which materials need anti-static treatment. No sense wasting time with those materials which do not have a static issue.

And be aware that the amount of cleaning liquid you put onto a material can cause after-effects when that same material is heated by the UV lamps.

272. 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). Dust can be a problem in places and seasons with low humidity. This is one of several reasons why you should have humidity control in your printshop, to allow maintaining proper humidity level for optimum performance of your printer.

SUBSTRATES: Cleaning, Priming, Preparation

273. Do you have to brush off or otherwise clean each sheet of incoming material by hand before you print on it?
Depends on what media you are printing on. Manufacturers of media are doing media for inkjet printers. This inkjet media generally doesn't need to be cleaned or brushed off.
For flat rigid material generally yes. The need to clean incoming materials is typical of any printer. Some materials have more detritus or dust or issues than other materials. And some suppliers offer better materials than others.

I rarely see any printer operator attempting to clean roll-fed materials.

274. What liquid cleaning material should you use to clean your materials? Which kind of cleaner, and which kind of materials per cleaner?
Alcohol. The advantage of alcohol is that it is a strong cleaner and dries very fast. These procedures help surface tension.

275. How often is pre-treatment required, either receptor coating or other special surface treatment to the material to be printed?
Pre-treatment is generally to remove charge that expels the ink. It helps surface tension.

276. 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 may help on some materials if you do the treatment within a few hours or day or so before printing. Otherwise the corona treatment wears out after a while, so has to be refreshed before printing to be effective. So buying pre-treated material is only a good idea if it is fresh (but you have no way to know how long the material was in a warehouse before reaching your shop).

277. 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, or top coating by a Drytac VersaCoater, can also serve to provide a glossy finish on a material that is naturally matte.

Lamination will also cover up "lawnmower banding" appearance. Lawnmower appearance is caused by bi-directional printing.

Some substrates come already pretreated, especially media manufactured for inkjet printers, whereas other media whose purpose is not only to be printed on, might require some pretreatment to help ink adhesion.

WHAT IS THE INTENDED MARKET FOR THIS PRINTER?

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

Small sign shops that wish to jump to the UV applications market. These sign shops generally have a small solvent roll-to-roll printer, a Roland or a Mimaki. Part of the philosophy of the design of the EFI Rastek H650 is to build a more accessible printer with the same quality than the H700.

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

We would have to wait to know, but so far this printer has been bought by sign shops.

APPLICATIONS

280. What are the applications listed by the manufacturer?

Banners, billboards, display graphics, flags, POP signage, indoor and outdoor signage.

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

There are two issues with printing on fabrics: first, the ink goes through the weave and ends up on the table or transport belt or platen. Second, the fibers from fabrics or mats can get onto the printhead nozzle plate and sometimes up into the nozzles.

INK

282. Is there a special ink for flexible material, and another ink for rigid material? What other inksets are available? Is there any choice in inks?
Not at the moment.

283. If there are two inks, how difficult is the changeover from one ink to the other?
There is only one kind of ink for this printer.

284. How many colors are used to produce output - four, six, or eight?
You can have a basic configuration of CMYK or CMYK+W.

285. Other than white, how many spot colors are available? What about metallic colors?
There are no spot colors available. In general, the extra features increase the price, which is the opposite of what EFI Rastek wants to achieve with this printer.

286. What is shelf life of the ink (CMYK)?
12 months.

Shelf life of the ink depends on storage temperature, plus on how honest the company was that delivered the ink. If the company bought too much ink, and could not sell it fast enough, they might be tempted to back date the shelf life.

287. Does the white ink have a shorter shelf life?
No. Shelf life for white is the same.

288. What company makes the inks? Choices include Hexion, Sericol, Sun, Triangle, Toyo, and several others.
DIC is the official ink manufacturer for the Rastek printers.

289. Does the printer manufacturer have its own ink chemists on staff?
Grapo, being a printshop, uses UV-cured ink on a regular basis. So their printshop for billboards, banners, POP, thermo-formable and other applications gives them daily experience. In some aspects this counts more than having an ink testing laboratory per se (which they do not have).

Durst, HP and comparable large printer manufacturers have their own ink chemists (even when they don't necessarily manufacture their own ink). But even when a company owns their own ink factory, sometimes they also rebrand the ink from completely different ink companies when they need an ink that themselves do not yet make.

290. How often do ink formulas change? What are the implications for color management?
DIC doesn't change the ink formulas unless EFI asks to.

This model has a CMYK + W configuration. The bottle at the far left is the one for white ink.

INK: White & Varnish

291. Is white ink available?
Yes.

292. To use white ink does that require not using light colors in order to make space for the white ink?
The basic model comes in CMYK. You can ask for CMYK+W, so there is no need to eliminate one ink channel to have white.

It is claimed that if you have variable droplet heads (and thus can achieve really small ink droplets) that you don't absolutely need light Cyan and light Magenta. But on the Oce 250, they claim this and I am skeptical; or maybe it is just the dithering pattern of their PosterShop RIP that causes the noticeable dithering pattern (this RIP is renowned for this issue).

293. What is the sequence of printing the white ink? Can you print all white and then print colors on top?
You can print white under or on top the other colors.

294. 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.

295. Is the white ink situated in the same area as the other inks?
Yes the printhead for white is located in the same area as the others.

This question is in the FLAAR FAQs because the Zund 250 situated their white ink up inside the printhead carriage. If you have 500 features on a printer, 200 tend to be standard (similar solutions on most UV printers); another 200 are special or have a few tweaks, and one or two are unique.

INK Cost

296. Does the refill container of ink come in cartridge, bottles or bulk? How large are the ink containers for this replacement ink?
The ink comes in 1 liter bottles.

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 other than the narrow format Roland LEC-300 uses Epson printheads: one Eastech printer tried, but it is not widely used.

297. What is the cost per container? What is this cost translated to liters?
$180 is the price for a 1-liter bottle. Oce and Gerber UV flatbeds have perhaps the most expensive ink brands in the market; around $250 per liter. Other companies use inks whose prices are around the $120/liter.

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.

298. Does the printer itself have a means to keep track of ink usage? Is this a guestimate, or an actual count of droplets fired?
No, but Onyx RIP has a feature that tells you the ink usage.

299. How much ink is used to print a square unit?
1ml of ink will cover a square foot.

Ink comes in 1 liter bottles.

300. What is the cost, in ink, per square unit?
18¢ per sq ft.

301. How many square units does 1 liter of ink print?
1 liter will print 1000 sq ft.

302. Can the printer software estimate the cost per print job?
With Onyx it is possible.

303. Where is waste ink collected? In a tray? In a bottle?
Waste ink falls in a tray from where the ink goes to a waste container.

304. How much ink does the waste ink container hold?
3.5 liters.

305. Where is the waste container situated? Is it outside, or inside a cabinet?
At the back.

A bottle of ink will print 92.2m²

INK: Supply System, Tubing, Filters, etc

306. Where are the printer's ink containers located? Front, back, or end? Up on top or lower down?
The ink containers are located at the back, left area.

307. 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.

308. What filters are on the ink system to trap particles or trap gelled ink?
There are two Pall filters per ink line.

309. How often do the ink filters have to be checked? Cleaned? Changed?
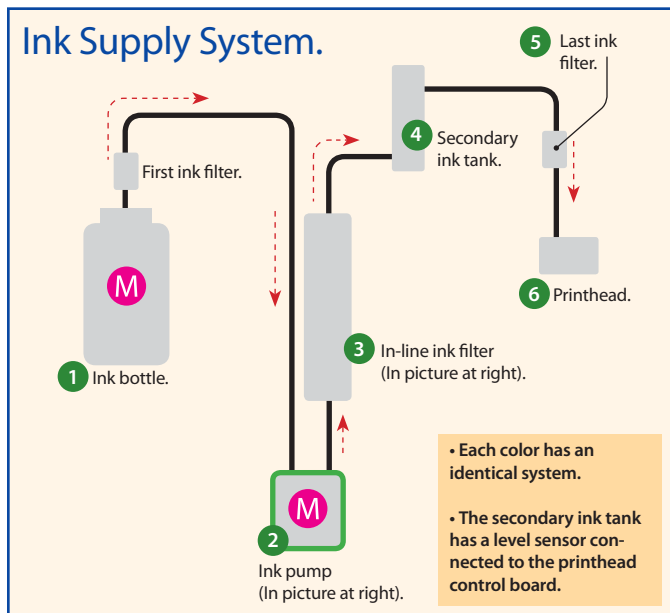Every three months.

310. What does a new ink filter cost?
$100. This is for the main filters. These filters need to be replaced every two years.

311. Describe the ink supply system (to the printhead)?
Ink is pulled out from the bottles by ink pumps that move the ink to the in-line ink filter. After passing through these filters, ink goes to the secondary ink tank and then to a second set of filters (one filter per color) and finally to the printheads.

Ink Supply System.

5 Last ink filter.
4 Secondary ink tank.
First ink filter.
M
1 Ink bottle.
6 Printhead.
3 In-line ink filter (In picture at right).
M
2
Ink pump (In picture at right).

• Each color has an identical system.

• The secondary ink tank has a level sensor connected to the printhead control board.
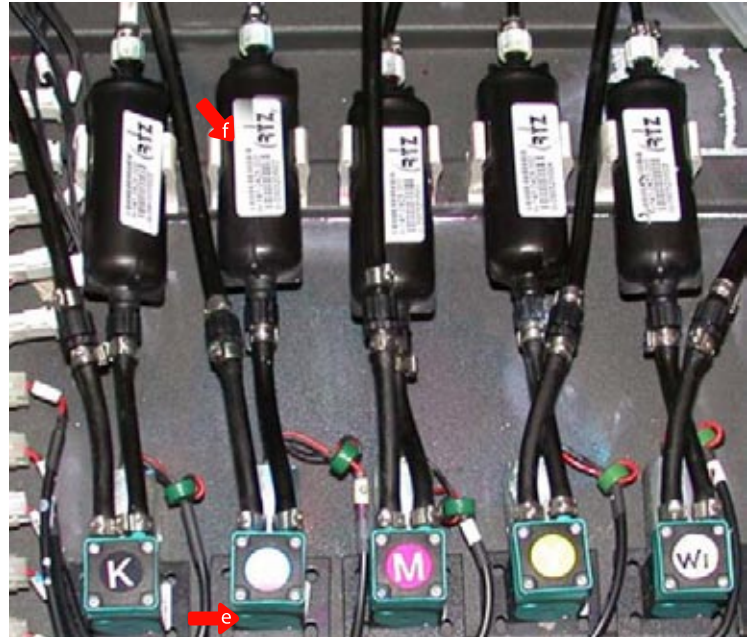

Photo extracted from the user's manual. Ink is sucked by the ink pumps (e) and carried into the main ink filters (f). There is an identical system for each color.

312. Are ink tubes black, opaque but white?
Yes, all the ink tubes are black.

The first year's production of the hybrid UV printer of Infiniti used ink tubing so flimsy that the tubes split, dissolved, or became disconnected on a regular basis. This is what happens when you take a solvent printer and try to retrofit it to take UV-cured ink. But something similar happened when Roland and other companies tried to run the first generation eco-solvent ink through their printers which previously were made only for water-based ink: the fittings and other parts of the original ink delivery system were made to handle water, not solvents. There were endless tech support issues for more than a year as a result. At least Roland and Splash of Color finally fixed these issues (and two different eco-solvent ink chemistries were developed in subsequent years as well).

The secondary ink tanks are located behind the printhead carriage.

313. What kind of e-chain is used? Igus brand?
It is Igus but we need to find the exact model.

The energy chain is the plastic linked system that holds all the cables and ink tubing so that it does not get rubbed while being moved back and forth to feed the carriage. Most mid-range and almost all high-end UV printers have an energy chain from the company Igus.

314. Where, and in how many locations, is the ink heated?
Ink is heated inside the printheads.

In over 80% of the UV-curing printers that I have inspected, ink tends to be heated in two locations: in a sub-tank, and on the printhead. Most UV printheads have special features in or on the printhead to facilitate heating the ink. This is to prepare the viscosity so the ink is liquid enough to jet out the nozzles; this ink heating has nothing to do with the ink needing to be cured.

So far, the only printer whose ink does not get heated at the printheads is the new Roland LEC-300. This is also the only UV printer, so far, which successfully uses an Epson printhead.

315. To what degree is the ink heated?
35˚ to 45˚.

316. 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.

317. Has any misting or spray been reported? What about ink inside the machine parts?
Not with Toshiba Tec.

Just ask any ink chemist about ink misting; then ask most sales reps. Most people in a typical booth are in a state of denial, or do not fully understand the concept of misting.

Most safety instructions do not mention the potential of the UV ink misting during printing. Some chemists have told me that there is no way to totally prevent all misting since you are generating x-million drops a second from a rapidly accelerating carriage. Misting is inevitable. The most misting that I have seen so far was inside an Infiniti UV printer: the entire surface of the inside (platen, rollers, etc) was totally covered with misted ink). The second most amount of ink misting that I have seen was in a ColorSpan 72UV X. But many other printers mist as well. You can check simply by putting a white swab or white cloth or white paper in a fixed location inside the printer (under the hood). Check it every week or so to see how much misted ink has settled on it.

This is the amount of ink that you may be breathing if the workplace is not adequately ventilated.

INK: Longevity

318. What about longevity indoors: where people or objects may scratch, smudge, or rub against the printed surface?
The life expectancy of a print is 3 years outdoors. For indoors applications, it is 10 years. These are rough estimates since no one has actually kept track of how long UV-cured inkjet printers actually hold up, plus longevity depends as much on the media and the local weather as the ink itself.

319. 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.
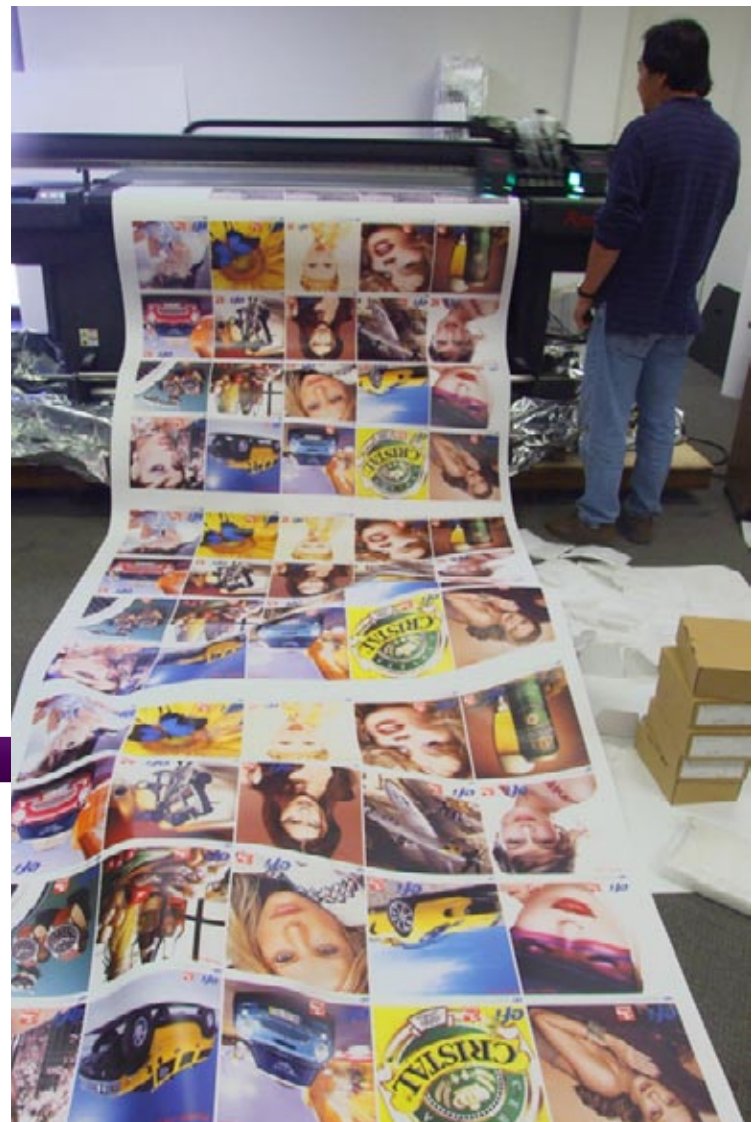
Longevity of ink indoors and outdoors is also influenced by the kind of media you print on.

320. 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?

It is not recommended to clean the media with liquids just after printing.

- Ammonia (in Windex and comparable cleaning liquids)
- Acetone
- Cleaning alcohol
- Gasoline
- Soap and water with sponge
- Soap and water with a broom
- Scotch-tape pull-off test

INK Color Gamut

Color gamut is nice, especially yellow colors are bright.

321. Which colors print best?

The samples printed at the headquarters in San Jose have a nice color gamut. I only noticed that in one of the images the red was too magenta.

Color gamut will depend on the color of the material on which you are printing, on your experience with color management, and whether you are using canned ICC color profiles or custom profiles that you made yourself.

THE UV CURING LAMPS

322. 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.

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

These are continuous (mercury arc).

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), Mimaki, and Roland. The Gerber Solara ion uses a rare type of long relatively cool UV lamp that is not used by any other wide-format inkjet printer manufacturer.

324. How many watts are the lamps?
800 Watts.

325. How many lamps does the printer use?
2 lamps.

Two is the usual number of lamps. Some cheap Chinese printers use only one lamp. Mimaki uses one lamp on several of their narrow-format UV printers to avoid the lawnmower effect that is caused by bi-directional printing (bi-directional print requires two lamps, one for each direction of ink laydown by the printer carriage).

The Agfa :Anapurna 100 (a printer that was never finished due to being too complex), and its recent replacement, the :Anapurna XLS, have three sets of lamps: all curing, not for pinning. The Lüscher JetPrint, due to its über-dimensional size, may also have needed more than two lamps (whatever it had did not function fully adequately).

326. 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?
Not on this model. But you can have one lamp on and the other off.

The control buttons for the UV lamps are at the front.

327. What shuts the lamps off? For example, after so many minutes of not being used; or if they overheat?
This is a crucial question, and one seldom asked elsewhere: if your UV lamps need to be turned off after the printer being unused for 5 to 10 minutes, then your lamps' life gets used up quickly (if they are mercury arc). Each strike (turning the lamp off and on one time) can lower the life of the lamp by one or two hours. So ideally you want a kind of UV lamp system where the lamps can stay on as long as possible to avoid having to turn them off and on all day long.

Another downside of having to turn the lamps off is that you then have to let them cool down, and then have to let them heat up again. Most of these issues are with mercury arc lamps (due to their intense heat). You don't have these problems with LED lamps.

328. How long does the lamp last, in terms of hours of operation?
1000 hours.

There is not a realistic number for this question, but in general, if the printer is not working for 15 minutes, it will go off.

329. 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.

The UV lamps are covered, but there is still some light leakage.

330. How many hours are used up by each "strike" (by each time you turn the lamps on)?
There is not a realistic number for this question, but in general, if the printer is not working for 15 minutes, it will go off.

331. Can the lamp alone be replaced or does the whole assembly need replacement?
You can replace only the lamp.

UV CURING, and ODOR of the printed image

332. Are the UV lamp fixture set at an angle or perfectly parallel to the printing plane?
The lamps are set in a perfectly vertical position.

333. How much odor is emitted by a fresh print?
The UV ink has odor to some degree, but never as strong as a solvent print.

UV LAMPS: Cooling

334. Are there shutters?
Yes, each lamp has a system of shutters.

Shutters help control light leak and save from having to turn the lamps off. So the lamps last a bit longer and you can be more productive, not having to wait for the lamps to cool down and then warm up all over again. But shutters are primarily for controlling the extreme heat of mercury arc UV curing lamps.

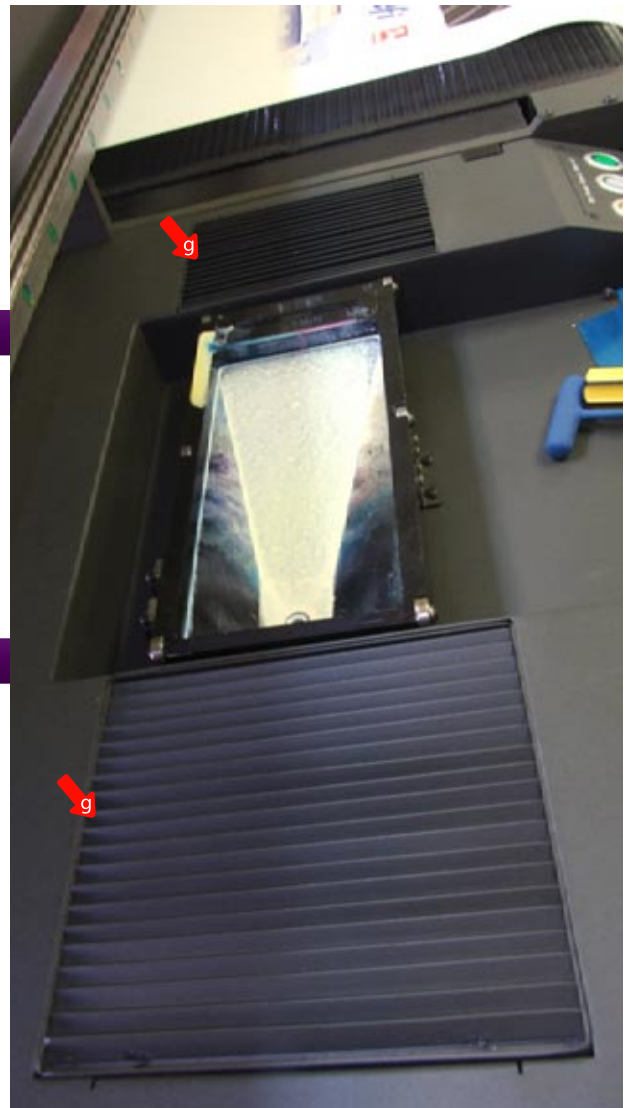### 335. What settings to the shutters have?
The shutters are either on or off. There are no intermediate settings.

336. How are the lamps cooled? Air? Fans? Water-cooled?
There are two small fans per lamp.

337. Are there fans elsewhere in the printhead carriage area?
No. Only in the electronics that are below.

After finishing a print job, the printhead carriage is parked at the left and the lamps rest over the lamp sinks (g).

RIP SOFTWARE & Printer Software

338. Which RIPs are featured?
EFI Fiery XF is the default RIP, but you have the option to have Onyx PosterShop for $1000.

339. Does the price of the printer include a RIP?
Yes, the price of the printer includes the Fiery XF RIP.

340. Is a computer and monitor included (to run the RIP)?
Yes, a PC is included.

341. What is the operating system of the RIP software?
Both the Fiery XF and the Onyx run with Windows XP.

342. Is your printer and/or RIP Pantone certified?
Yes, both are Pantone certified.

PRODUCTIVITY & ROI (Return on Investment)

343. 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?
Yes.

90% of the different brands of printers can't produce usable output at their fastest claimed speed. So I call these speeds "junk mode." It is false advertising in probably half the spec sheets.

344. What is the level of productivity, high, medium, low?
The spec sheet lists
- **High Quality Mode:** 65 ft2(6.03m2) per hour.
- **Production Mode:**   120 ft2(11.14m2) per hour.
- **Billboard Mode:**   230 ft2(21.36m2) per hour,

But these data is lower than you can really achieve.

345. Can this printer hold up to two or three shifts per day all week?
No, this printer was not designed for more than one shift.

GENERAL CONSIDERATIONS

346. How many printers of this model are in use; in the USA; in the rest of the world?
As of August 2009, about 6 models have been shipped; 2 in the US, one to Singapore, one to Japan, and another to South Africa. Now, in September, sales are taking off.

It is crucial for a printshop owner, who is making their short list of which printers to consider buying, to know how many printers of each brand have been sold.

COMPARISONS WITH OTHER PRINTERS

347. When people are considering buying this printer, what other printer(s) are they also looking at?
HP Scitex 950, Agfa and Dilli combo printers, the GCC StellarJET K72UV.

348. What features on the other printers may be issues?
The HP Scitex 950 is in a much higher price range. The main differential factor with the Dilli and Agfa is the price; those printers are at least twice the price of the H650. The GCC K72UV is locked in the 14pl offered by the Konica Minolta heads, whereas the H650 offers variable drop size from 6pl to 42pl.

SUMMARY: Image Quality Issues: Banding

349. Is there banding in areas of solid black?
Although not easily noticed, I did see banding in one of the samples, but it was printed at a low quality setting.

350. How can banding be avoided?
Accuracy in feeding and experience is what characterizes the design of the EFI Rastek H650 in terms of getting rid of banding issues.

More passes tend to get rid of banding on almost any and all inkjet printers. Of course it helps if the machine is precision engineered so you don't get much banding at four passes and above. Banding at two passes is normal. You can eliminate pass-overlap banding by using an interweaving technique (which Mutoh developed and now Roland and others have copied).

SUMMARY: Image Quality Issues: General

351. Is text sharp or fuzzy? What is the smallest text that you can easily read?
The EFI Rastek prints text as small as 3 or 4 points size.

352. 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?
The inks for the H650 are not very flexible. The ink on the EFI Rastek T600 dedicated flatbed is more flexible.

CONCLUSIONS

353. Are you satisfied with this printer to the point that you would recommend it to someone else?
I would not waste my time spending days inspecting this printer and weeks preparing this report if I did not find that this printer had merit.

354. Would you recommend that others buy this printer?
There are four stages to a FLAAR evaluation:
- "first look" at major international trade shows
- demo room testing,
- factory visit,
- and site-visit case study in a printshop.

We have taken initial notes on trade shows during 2009 plus a visit to the EFI Rastek headquarters in San Jose, California. We have found this a good printer with features and characteristics that make it worth considering as one of your most important options when looking for a UV printer in an entry-level price range.

Conclusions

Pros
This printer was designed with the philosophy of building a high-quality UV printer at a more affordable price than most UV printers in the market; also, the level of ease of use is one of the core aspects of the philosophy of this model.

The variable drop size as wide as 6pl to 42pl gives the EFI Rastek the ability to offer very high quality images.

The tech support organization is efficient in the US; you can have a spare part shipped and delivered within the first hours of the next day, and depending on your location, even in a shorter time.

Cons
UV light is still visible and is a potential hazard to the operator's eyes.

A means to keep track of ink usage would be advisable in the standard RIP, although this feature is available with Onyx PosterShop.

Potential issues (not serious enough to be a fully negative point)
On some other combo printers, you load at the front, align the media against the registration system and rewind the transport belt to place media in the "print" position. With the EFI Rastek H650 the operator needs to go back and forth to load rigid media at the back, which could be con-

sidered a downside in terms of production times. On the other hand, the advantage of this method of loading is that you can feed another board at the back while the first one is being printed on.

Conclusions
In past years ColorSpan was the #1-selling printer at entry-level. But that was a hybrid style (pinch roller on grit roller). The H650 is a combo with moving transport belt, which is considered a better structure to handle many kinds of thick flat rigid materials. The ColorSpan 5440uv series had a series of issues and was unfortunately not popular as a result. Although HP invested considerable money and effort into fixing most of the issues (with the ink pump and Ricoh printheads), this entry-level hybrid printer was unofficially phased out during summer 2009 (it was no longer featured at trade shows; this was very obvious). This situation creates an opening for the EFI Rastek H650.

I have seen the EFI Rastek H650 in action in several trade shows. It was printing every time, including most recently at Print '09. I specifically went to check it in the EFI booth because someone said he had seen it not printing. The quality has been very good, especially when I saw the printer in action at FESPA Digital Europe in May. I have also inspected the factory where these printers are manufactured by RTZ (FLAAR makes considerable effort to check a printer before we write a review).

The next crucial step is to see how the printer functions out in the real world. This we will do with a site-visit case study as soon as this becomes possible.

First issued October 2009.

Reality Check

Being a university professor for many years 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, because 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 most universities 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 53,000 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. If you are a Subscriber or manager in a company that is a research sponsor, you can obtain the next update by writing ReaderService@FLAAR.org. If you are neither a Subscriber or a research sponsor, simply order the newest version via the e-commerce system on www.wide-format-printers.NET. Please realize that because we have so many publications and many are updated so frequently that we have no realistic way to notify any reader of when just one particular report is actually updated.

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.

Please Note

This report has not been licensed to any printer manufacturer, distributor, dealer, sales rep, RIP company, media, or ink company to distribute. So, **if you obtained this from any company, you have a pirated copy.**

If you have received a translation, this translation is not authorized unless posted on a FLAAR web site, and may be in violation of copyright (plus if we have not approved the translation it may make claims that were not our intention).

Also, since this report is frequently updated, if you got your version from somewhere else, it may be an obsolete edition. FLAAR reports are being updated all year long, and our comment on that product may have been revised positively or negatively as we learned more about the product from end users.

If you receive any FLAAR Report from a sales rep, in addition to being violation of copyright, it is useful to know if there is a more recent version on the FLAAR web site, because every month new UV printers are being launched. So what was good technology one month, may be replaced by a much better printer elsewhere the next month.

To obtain a legitimate copy, which you know is the complete report with nothing erased or changed, and hence a report with all the original description of pros and cons, please obtain your original and full report straight from www.FLAAR.org.

Your only assurance that you have a complete and authentic evaluation which describes all aspects of the product under consideration, benefits as well as deficiencies, is to obtain these reports directly from FLAAR, via www.wide-format-printers.NET.

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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 work-around. 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, often 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 resources 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.

FLAAR has no way of testing 400+ specifications of any printer, much less the over 101 different UV printers from more than 46 manufacturers. Same with hundreds of solvent printers and dozens of water-based printers. We observe as best we can, but we cannot take each printer apart to inspect each feature. And for UV printers, these are too expensive to move into our own facilities for long-range testing, so we do as best as is possible under the circumstances. And when a deficiency does become apparent, usually from word-of-mouth or from an end-user, it may take time to get this written up and issued in a new release.

Another reason why it is essential for you to ask other printshop owners and printer operators about how Brand X and Y function in the real world is that issues may exist but it may take months for these issues to be well enough known for us to know the details. Although often we know of the issues early, and work to get this information into the PDFs, access to information varies depending on brand and model. Plus with over 300 publications, the waiting time to update a specific report may be several months. Plus, once a printer is considered obsolete, it is not realistic to update it due to the costs involved.

For these reasons, every FLAAR Report tries to have its publication date on the front outside cover (if we updated everything instantly the cost would be at commercial rates and it would not be possible to cover these expenses). At the end of most FLAAR Reports there is additionally a list of how many times that report has been updated. A report with lots of updates means that we are updating that subject based on availability of new information. If there is no update that is a pretty good indication that report has not been updated! With 101 models of UV printers, several hundred solvent printers, and scores of water-based printers, we tend to give priority to getting new reports out on printers about which not much info at all is available elsewhere. So we are pretty good about reporting on advances in LED curing. But glitches in a common water-based printer will take longer to work its way through our system into an update, especially if the glitch occurs only in certain circumstances, for example, on one type of media. With several hundred media types, we may not yet have utilized the problem media. While on the subject of doing your own research, be sure to ask both the printer operator and printshop owner or manager: you will generally get two slightly different stories. A printer operator may be aware of more glitches of the printer than the owner.

If a printer is no longer a prime model then there is less interest in that printer, so unless a special budget were available to update old reports, it is not realistic to update old reports. As always, it is essential for you to visit printshops that have the printers on your short-list and see how they function in the real world.

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.

Results you see at trade shows may not be realistic

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 unidirectional, 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 laminat-

ing 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.

Images printed at trade show may be in uni-directional mode: so you may not realize the printer has bi-directional (curing) banding defects until you unpack it in your printshop. Bi-directional curing banding is also known as the lawnmower effect. Many printers have this defect; sometimes certain modes can get rid of it, but are so slow that they are not productive.

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

Factors influencing output

Heat, humidity, 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.

Realize that a FLAAR Report on a printer is not by itself a recommendation of that printer. In your local temperature, in your local humidity, with the dust that is in your local air, with your local operator, and with disorientation of the insides of a printer during rough shipment and installation, we have no knowledge of what conditions you will face in your own printshop. We tend to inspect a printer first in the manufacturing plant demo room: no disjointed parts from any shipment since this printer has not been lifed by cranes and run over a rough pot-holed highway or kept in smeltering heat or freezing cold during shipment.

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.

Availability of spare parts may be a significant issue

Chinese printers tend to switch suppliers for spare parts every month or so. So getting spare parts for a Chinese printer will be a challenge even if the distributor or manufacturer actually respond to your e-mails at all. Fortunately some companies to have a fair record of response; Teckwin is one (based on a case of two problematical hybrid UV printers in Guatemala). The distributor said that Teckwin sent a second printer at their own expense and sent tech support personnel at their expense also. But unfortunately both the hybrid UV printers are still abandoned in the warehouse of the distributor; they were still there in January 2009. But Teckwin has the highest rating of any Chinese company for interest in quality control and realization that it is not good PR to abandon a client or reseller or distributor all together.
Recently we have heard many reports of issues of getting parts from manufacturers in other countries (not Asia). So just because you printer is made in an industrialized country, if you are in the US and the manufacturer is X-thousand kilometers or miles away, the wait may be many days, or weeks.

Lack of Tech Support Personnel is increasing

The book of sales in the third quarter of 2008 resulted in many tech support problems.

The recession resulted in even more: some manufacturers may need to skimp on quality control during a recession, or switch to cheaper parts suppliers. Plus they are not hiring enough tech support during a recession. So the bigger and more successful the company, in some cases the worse these particular problems may be.

Any new compiled printer may take a few months to break in

Any new printer, no matter who the manufacturer, or how good is the engineering ane electronics, will tend to have teething issues. Until the firmware is updated, you may be a beta tester. This does not mean the printer should be avoided, just realize that you may have some downtime and a few headaches. Of course the worst case scenario for this was the half-million dollar Luscher JetPrint: so being "Made in Switzerland" was not much help.

Counterfeit parts are a problem with many printers made in China

Several years ago many UV printers made in China and some made elsewhere in Asia had counterfeit parts. No evaluation has the funding available to check parts inside any printer to see if they are from the European, Japanese, or American manufacturer, or if they are a clever counterfeits.

Be realistic and aware that not all materials can be printed on equally well

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.

It is typical for some enthusiastic vendors to claim verbally that their printer can print on anything and everything. But once you unpack the printer and set it up, you find that it requires primer on some materials; on other materials it adheres for a few weeks but then falls off.

And on most hybrid and many combo printers, some heavy, thick, or smooth-surfaced materials skew badly. Since the claim that the printer will print on everything is usually verbal, it is tough to prove this aspect of misleading advertising to a jury.

Not all inks can print on all materials. And at a trade show, many of the materials you see so nicely printed on, the manufacturer may be adding a primer at night or early in the morning: before you see the machine printing on this material.

We feel that the pros and cons of each product speak more than adequately for themselves. Just position the ad claims on the left: put the actual performance results on the right. The unscrupulous hype for some printers is fairly evident rather quickly.

Be sure to check all FLAAR resources

Please realize that with over 200 different FLAAR Reports on UV printers, you need to be sure to check the more obscure ones too. If a printer has a printhead issue, the nitty gritty of this may be in the FLAAR Report on printheads. The report on the model is a general introduction; if we discussed the intimate details of printheads then some readers might fall asleep. And obviously do not limit yourself to the free reports. The technical details may be in the reports that have a price to them. Our readers have said they prefer to have the general basics, and to park the real technical material in other reports that people can buy if they really want that level of information.

So it may be best to ask for personal consulting. The details of the problems with the ColorSpan 5400uv series are rather complex: namely the center row of the Ricoh printheads. This would require an expensive graphic designer and consultants to show the details. And the design of the printhead would probably be altered by the time we did any of this anyway. So it is essential to talk with people: with other end-users, and with FLAAR in person on a consulting basis.

shows another brand had over 30 of their printers in booths in virtually every hall, each one producing museum quality exhibits. Not our fault when we report what we see over and over and over again. One of our readers wrote us recently, "Nicholas, last month you recommended the …… as one of several possible printers for our needs; we bought this. It was the best capital expenditure we have made in the last several years. Just wanted to tell you how much we appreciate your evaluations…."
FLAAR is a non-profit educational and research organization dedicated for over 36 years to professional photography in the arts, tropical flora and fauna, architectural history, and landscape panorama photography.

Our digital imaging phase is a result of substantial funding in 1996 from the Japanese Ministry of Public Education for a study of scanning and digital image storage options. This grant was via Japan's National Museum of Ethnology, Osaka, Japan. That same year FLAAR also received a grant of $100,000 from an American foundation to do a feasibility study of digital imaging in general and the scanning of photographic archives in particular.

The FLAAR web sites began initially as the report on the results of these studies of scanners. Once we had the digital images we began to experiment with digital printers. People began to comment that our reports were unique and very helpful. So by 1999 we had entire sections on large format printers.
FLAAR has existed since 1969, long before inkjet printers existed. Indeed we were writing about digital imaging before HP even had a color inkjet system available. In 2000 FLAAR received an educational grant from Hewlett-Packard large format division, Barcelona, Spain, for training, for equipment, and to improve the design and navigation on the main web sites of the FLAAR Network. This grant ran its natural course, and like all grants, reached its finishing point, in this case late 2005.

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

We thank MacDermid ColorSpan (now part of HP), Hewlett-Packard, Parrot Digigraphic, Color DNA, Canon, Gandinnovations, and other companies for providing funding for technology training for the FLAAR staff and our colleagues at Bowling Green State University in past years and for funds to allow us to attend all major international trade shows, which are ideal locations for us to gather information. We thank Sun LLC, Caldera, Raster Printers (EFI Rastek), DEC LexJet, DigiFab, Barbieri electronic, Seiko, Mutoh Europe, IP&I, Dilli, Yuhan-Kimberly, GCC, Grapo, Durst, and WP Digital for providing funds so that we can make more of our publications free to end-users. During 2000-2001 we had grants to cover all the costs of our publications, and all FLAAR Reports were free in those early years. As that early grant naturally expired after a few years, we had to begin charging for some of our reports to cover costs. Now (in 2009), we are seeking corporate sponsorship so we can gradually make another 20% of our publications free to our readers.

Since 2006 we do a major part of our evaluations at a factory and headquarters demo room. Since the university does not fund any of

these trips, it is traditional for the manufacturer to fund a research sponsorship. In the US this is how most university projects are initiated for decades now, and it is increasing. In fact there is a university in Austria that is not an "edu" but is a "GmbH", funded by the chamber of commerce of that part of Austria. In other words, a university as an educational institution, but functioning in the real world as an actual business. This is a sensible model.

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

Barbieri electronic (color management), Caldera (RIP), ColorSpan, DEC, Durst, Gerber, Grapo, IP&I, Mimaki USA, Mutoh, Dilli, GCC, NUR, Oce, Shiraz (RIP), Sun, Teckwin, VUTEk, WP Digital, Xerox, Yuhan-Kimberly, Zund have each brought FLAAR staff to their headquarters and printer factories. Bordeaux, InkWin and Sunflower ink have brought us to inspect their ink manufacturing facilities and demo rooms. We have visited the world headquarters and demo rooms of HP in Barcelona and received informative and helpful technology briefings. We are under NDA as to the subjects discussed but it is important that we be open where we have visited. Mimaki Europe has had FLAAR as their guest in Europe to introduce their flatbed UV printer, as have other UV-curable manufacturers, again, under NDA as to the details since often we are present at meetings where unreleased products are discussed. Xaar has hosted an informative visit to their world headquarters in the UK. You don't get this level of access from a trade magazine writer, and I can assure you, we are provided much more detailed information and documentation in our visits than would be provided to a magazine author or editor. Companies have learned that it's a lot better to let us know up front and in advance the issues and glitches with their printers, since they now know we will find out sooner or later on our own. They actually tell us they realize we will find out on our own anyway.

Contributions, grant, sponsorships, and project funds from these companies are also used to improve the design and appearance of the web sites of the FLAAR Information Network. We thank Canon, ColorSpan, HP, ITNH, and Mimaki for providing wide format printers, inks, and media to the universities where FLAAR does research on wide format digital imaging. We thank Epson America for providing an Epson 7500 printer many years ago, and Parrot Digigraphic for providing three different models of Epson inkjet printers to our facilities on loan at BGSU (5500, 7600, 7800). We thank Mimaki USA for providing a JV4 and then a Mimaki TX-1600s textile printer and Improved Technologies (ITNH) providing their Ixia model of the Iris 3047 giclee printer.

We thank 3P Inkjet Textiles and HP for providing inkjet textiles so we could learn about the different results on the various textiles. IJ Technologies, 3P Inkjet Textiles, ColorSpan, Encad, HP, Nan Ya Pepa, Oracal, Tara and other companies have provided inkjet media so we can try it out and see how it works (or not as the case may be; several

inkjet media failed miserably, one from Taiwan, the other evidently from Germany!). We thank Aurelon, Canon, ColorGate, ColorSpan, ErgoSoft, HP, PerfectProof, PosterJet, Onyx, Ilford, CSE ColorBurst, ScanvecAmiable, Wasatch and many other RIP companies for providing their hardware and software RIPs.

We thank Dell Computers for providing awesome workstations for testing RIP software and content creation with Adobe Photoshop and other programs. We also appreciate the substantial amount of software provided by Adobe. As with other product loaned or provided courtesy of ProVar LLC (especially the 23" monitors which makes it so much easier to work on multiple documents side by side).

We thank Betterlight, Calumet Photographic, Global Graphics, Westcott, Global Imaging Inc. Phase One, and Bogen Imaging for helping to equip our archaeological photo studios at the university and its archaeology museum in Guatemala. Heidelberg, Scitex, CreoScitex (now Kodak) and Cruse, both in Germany, have kindly provided scanners for our staff to evaluate.

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 were universities employees (as was 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 three manufacturers of piezo printers (Epson, Seiko, Mutoh, 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.

An evaluation is a professional service, and at FLAAR is based on more than 11 years of experience. An evaluation of a printer, an ink, a software, laminator, cutter or whatever part of the digital printing workflow is intended to provide feedback to all sides. The manufacturers appreciate learning from FLAAR what features of their printers

need improvement. In probably half the manufacturers FLAAR has dealt with, people inside the company did not, themselves, want to tell their boss that their pet printer was a dog. So printer, software, and component manufacturers have learned that investing in a FLAAR evaluation of their product provides them with useful return on investment. Of course if a printer manufacturer wants only a slick Success Story, or what we call a "suck up review" that simply panders to the manufacturer, obviously FLAAR is not a good place to dare to ask for such a review. In several instances it was FLAAR Reports that allowed a company to either improve their printer, or drop it and start from scratch and design a new and better one.

And naturally end-users like the opportunity to learn about various printers from a single source that covers the entire range from UV through latex through all flavors of solvent.

We have also learned that distributors often prefer to accept for distribution a printer or other product on which a FLAAR Report already exists.

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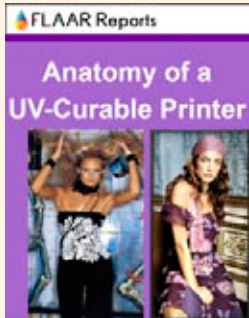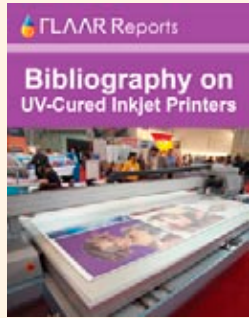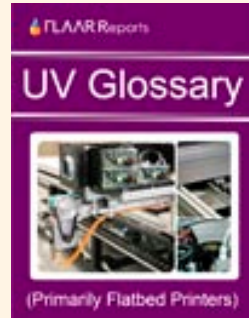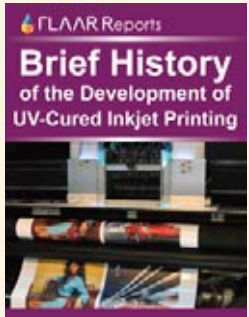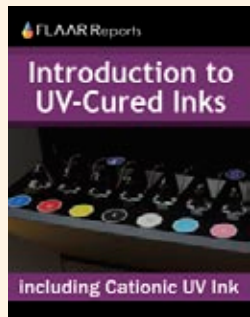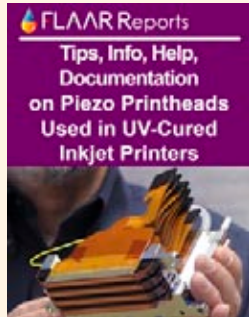
FLAAR also serves as consultants to Fortune 500 companies as well as smaller companies and individuals who seek help on which printers to consider when they need digital imaging hardware and software.

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.

These are some of the most
Recent FLAAR Reports (2007-2009)
You can find these and more reports at: www.wide-format-printers.NET

Introduction to UV Curable Inkjet Flatbed Printers

FLAAR Reports
Anatomy of a
UV-Curable Printer

FLAAR Reports
Bibliography on
UV-Cured Inkjet Printers

FLAAR Reports
Classifications of
more than 60
UV-Cured Printers

FLAAR Reports
How to Buy a UV-Cured
Inkjet Flatbed Printer
FAQs for UV Printers

FLAAR Reports
UV Glossary
(Primarily Flatbed Printers)

FLAAR Reports
Brief History
of the Development of
UV-Cured Inkjet Printing

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

FLAAR Reports
UV Lamps
for flatbed Inkjet Printers

FLAAR Reports
Introduction to
UV-Cured Inks
including Cationic UV Ink

FLAAR Reports
Tips, Info, Help,
Documentation
on Piezo Printheads
Used in UV-Cured
Inkjet Printers

Most recent UV Printers

FLAAR Reports
Roll to Roll UV Printers
for Billboards & Banners
Gandinnovations Jeti
3348 UV JetSpeed

FLAAR Reports
Roland LED-UV
Curing & Varnish
VersaUV Print&Cut
LEC-300

FLAAR Reports
Entry-Level Hybrid
UV Roll-to-Roll
LED Curing
Mimaki UJV-160

FLAAR Reports
HP Scitex FB6100
Formerly NUR Tempo UV Flatbed

FLAAR Reports
Flatbed UV Printer
Teckwin
TeckStorm

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Comments on UV Inkjet Printers at Major Trade Shows 2007-2009

Trends in UV Flatbed Printers documented at **DRUPA 2008**

UV Printers Trends 2008 — SGIA '08 **PART I**

Flatbed & Roll-to-Roll UV Printers — SGIA '08 **Part II**

Chinese-Made UV Flatbed Printers — Shanghai '08 Trade Show

UV Printer **TRENDS** — VISCOM ITALY '08

Trends In UV printers at **VISCOM Germany 08**

TRENDS, Part II: Markets & Technologies — UV-cured printers at **ISA 2009**

TRENDS, Part I: Analysis One by One of the UV-cured printers **ISA '09**

UV Market TRENDS — Observable at **FESPA Digital Europe 2009**

TRENDS in 2009 — Analysis One by One of the UV-cured printers at FESPA Digital Europe

TRENDS of UV-Cured Wide-Format Printers — Shanghai '09

UV COMBO FLATBEDS — Shanghai 2009

TRENDS IN HYBRID STRUCTURE UV PRINTERS — Shanghai 2009

UV Roll-to-roll — Observable at **Shanghai 2009**

UV Flatbed Printers at APPPEXPO, Shanghai '09

UV Printers Manufactured in China, Korea and Taiwan

Chinese UV Inkjet Printers 2009 — Comprehensive FLAAR Inventory

Chinese UV Inkjet Printers 2008 — Comprehensive (Complete) FLAAR Inventory

UV Printers Manufactured in Korea 2009 — Trends, Markets & Applications

UV Printers Manufactured in KOREA 2008

List of UV Printers Manufactured in ... **Taiwan 2009**