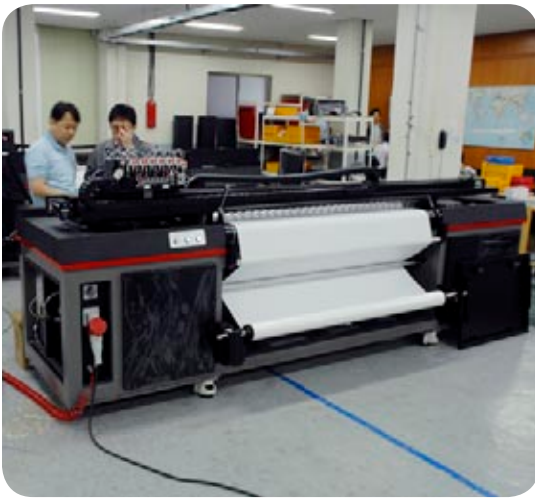




IP&I Cube 1606S and 1606F Sturdy Flatbed & Roll-fed UV Printers



Contents



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IP&I Cube 1606S and 1606F Sturdy Flatbed & Roll-fed UV Printers

THE BASICS

1. Brand name, model?

CUBE 1604F = CMYK

CUBE 1606F = CMYK+2W

CUBE 1606S = CMYKcm (6 Colors)

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

This printer comes in only one width, 1.6 meters wide.

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

IP&I is the manufacturer.

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

This printer differs from the larger 7-color version, the IP&I Cube260. There is a completely separate FLAAR Report on the Cube260.

5. What other printers of other brands are comparable?

At first several other brands and models appear comparable, but upon closer inspection you see that the IP&I is dramatically different than the GCC StellarJet 183. The GCC 183 is a hybrid printer which was still unfinished after being displayed at trade shows for over two years. The IP&I is a combo printer with a moving transport belt.

The differences between the IP&I with the Dilli Titan and its identical but rebranded Agfa :Anapurna M are more subtle. Since I have spent three days literally inside the IP&I 1606 printers in the factory and at the product launch in Korea I have more experience and can document the sturdy construction and abundant features of the IP&I Cube 1606 uv series.

6. When and where was this model first introduced?

ISA '07.

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

The printer is ready to ship by late summer 2007. I inspected the first three printers off the assembly line at the factory in early July 2007.

8. List price?

As with many products, the price varies slightly depending on what country you are in, and what extras you prefer. But the price should be under 115,000 Euros.

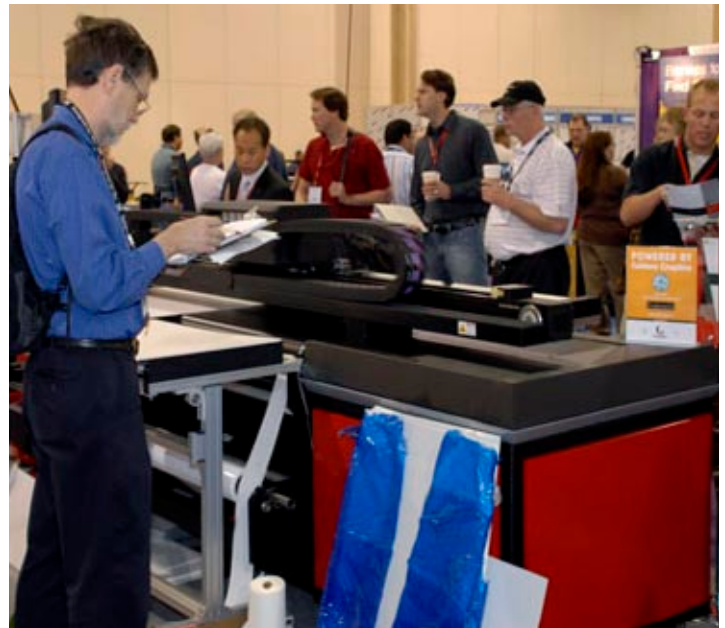
This is not a cheap Chinese printer. This is not a copy of someone else's printer. This is a well-designed and in many features the IP&I 1606 is a unique mid-range printer.

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

- Anti-Static wire (optional, as special order)
- Ionizer bar (optional, as special order)

The two rollers tables are included (these are extra cost on some other printers).

The roll-fed capability is included (these are extra cost on most other printers, especially those other printers that already cost more than the IP&I Cube).



Nicholas takes notes on the IP&I Cube 1606 at ISA 07

10. What other costs are involved?

If you need special features for unique applications you can ask to have custom-made features by special order.

11. 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, the printer comes with ink. (2 liters each color).

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

The dealer and/or distributor in your country or region is supposed to have spare parts. The individual printshop owner is not expected to buy a spare parts kit up front.

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

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

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

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

Base price, chassis and print engine	CUBE 1606F	CUBE 1606S
Base price, chassis and print engine	Consult local dealer	Consult local dealer
RIP Software, lite	Onyx Poster Shop, Caldera or Wasatch	Onyx Poster Shop, Caldera or Wasatch
RIP, full version		
transportation	FOB Korea	FOB Korea
installation	included	included
training	yes	yes
ink	2 liters every color	2 liters every color
warranty	Mechanical parts one year	Mechanical parts one year
spare parts kit	Optional cost	Optional cost
table(s)	included (2 sets) (Front/Rear)	included(2 sets) (Front/Rear)
Total cost	Consult local dealer	Consult local dealer

STRUCTURE OF THE PRINTER: Vacuum

15. Is there a vacuum function?

Yes.

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

Air pump.

17. In how many sections?

All one section but the size of this section (by 2.5cm increments) is user definable.

18. Just Off and On? Or variable?

On/Off.

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

Yes, this is a sophisticated printer with advanced features.

STRUCTURE OF THE PRINTER: Media Transport Mechanism & Media Path**20. 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 is made from the beginning as a UV-curable printer. This is a third-generation machine by IP&I: Revo was their first model; Cube260uv was their second model.

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

This printer has a moving transport belt hence is a combo style machine.



IP&I Cube 1606 at FESPA 07

STRUCTURE OF THE PRINTER: Transport Belt**22. Describe the transport belt? What material? What manufacturer?**

The material is , not woven.

23. Size, does it stick out?

The transport belt does not stick out the front or back. A distinguishing feature of the Dilli is that its belt sticks far out the front. Neither design is inherently better than the other, just different.

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

Woven belts flex too much. You can see this on every printer with a woven belt; these other belts are always askew.

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

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

26. What does the transport belt area of the printer look like under the belt? How many rollers control the belt: is the path of the belt horizontal, or triangular?

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

The IP&I Revo experimented with a third roller, to provide tension and reliability. This made the patch of the transport belt triangular. Based on experience with this belt roller design, they added a fourth roller. The result is what you get with the Cube 260 and the 1606: the most sophisticated transport belt I have yet seen: and I mean seen on quarter-million dollar printers.



IP&I Cube 1606 at factory

LINING UP FLAT MATERIAL (to help it feed straight)**27. What kinds of raised guide bars along the side of the table exist? Left or right? How long?**

Fixed (non-moveable), about 20" long, 1 cm high, black, raised bars on both sides of the table.

28. Does the drop-down gate have special fixtures for placing or measuring position of materials that are set against it?

There is a registration bridge, with measuring marks, all the way over across the feeding area. It has moveable drop-down positioning pins.



Measuring marks are used to attach rigid materials to the transport belt

ROLL-FED**29. If this is a dedicated flatbed or a combo design, is the roll-fed mechanism an option, or is it included?**

This is a combo printer with a roll-fed mechanism as standard equipment, already included on the chassis.

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

This printer has a row of 27 pinch rollers at the back, as you would expect also on a hybrid printer. But there is no grit-roller, since the entire transport belt functions as the drive roller.

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

The pinch rollers are over 1 cm in width separated from each other by about 4 cm.

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

At the back left there is a lever; lower the lever and the entire row of pinch rollers is raised.



There is a pinch roller about every 2 inches along the transport belt. A lever is used to raise all the pinch rollers at once.

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

On some hybrid systems it helps to raise any pinch roller that is over the edge of the media. This can help alleviate skew. So sometimes you would need to raise two individual pinch rollers (one at the left, one at the right). Of course this depends entirely on the width of the material and whether, by coincidence, a pinch roller happens to overlap the edge of the media at one side or the other, or both. It is rare to be able to (or need to) raise an individual pinch roller on a combo style UV printer.

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

Variable pressure is not traditional.

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

On a spindle. A saddle is usually used for longer heavier rolls.

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

Yes, there is a dancer bar. There are some quarter-million dollar combo printers that don't even offer a dancer/tension bar.

37. 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).

The roll-fed system is physically attached to the body of the printer.

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

There is no intermediate roller at the level of the belt. Instead there are two rollers below the level of the transport belt: one is about 8" down, and a bit out in front. The dancer bar is about 50 cm inside and below. This is a unique system.

Over and over again, you see this is not a solvent printer that has UV lamps bolted on. This is not a cheap low bid Chinese UV printer. Everything on this printer has been well thought out and is based on prior experience with Hypernics or the first two generations of IP&I UV printers. This is the third generation, and has corresponding experience available.

39. At the front, is there an extra roller bar(s) near the platen or transport belt? Is it a bar to roll under the media, or over the media, or are there both (in addition to pinch roller/grit roller arrangement).

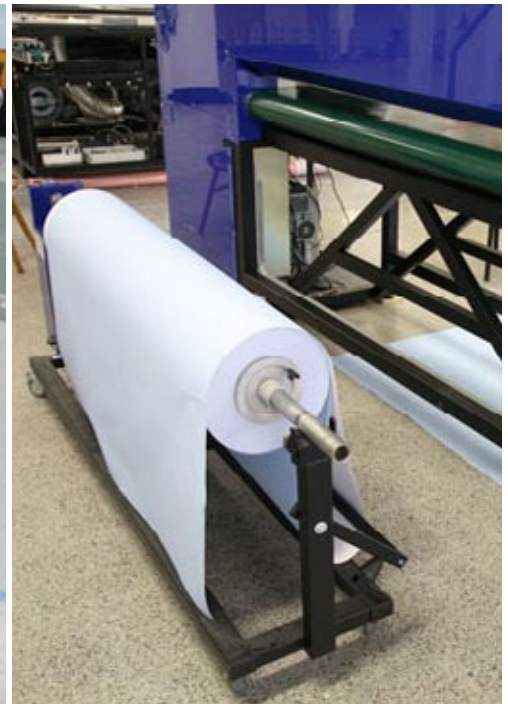
No.

40. How is the roll media handled at take-up position? For example, is there a dancer bar?

I have not noticed a dancer bar in the front.



Roll-fed system is physically attached to the printer. In the case of the 1606 model, the most convenient system for roll-fed media is a spindle, since it is not intended to handle extremely heavy rolls.



The Grapo Octopus is one of the few combi printers which roll-fed system is not physically attached to the body of the printer.

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

With some brands of printers you suspect that they are deliberately designed to waste ink and media since this is how those companies get their profits. Media is moved too far out, media is wasted before and after cutting, etc.

I have not noticed any aspect of the IP&I printers that deliberately waste media.

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

Being able to print on several different rolls of material simultaneously is common on grand format solvent-based printers but almost unknown (and unavailable) on printers less than 104 inches.

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

A trough is possible only on a printer with a fixed platen; there is no easy way to put a trough on a combo style printer.

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

Most combo-style printers have no on-board cutters.

45. 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.



There are two rollers below the level of the transport belt: one is about 8" down, and a bit out in front. The dancer bar is about 50 cm inside and below. This is a unique system.

STRUCTURE: Miscellaneous

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

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

The IP&I has four sturdy supports, with wheels. They are padded as well. There are also four leveling supports (two at each end). The wheels are on the main chassis.



Wheels and leveling supports.

TABLES for Combo or Hybrid Flatbed

47. What is the design of the take-up table?

- **Horizontal roller bars the full width of the table?**
- **Horizontal roller bars with rigid supports in the middle and/or elsewhere too?**
- **Separate flat bars with rows of tiny rollers?**
- **Solid flat table with small roller bars?**
- **Solid flat table with ball bearings?**
- **Another design?**

Table with roller bars.

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

There is one vertical support per side (total of two supports), but four legs from the horizontal bottom structure.

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

The wheels can be leveled.

50. Is the table physically attached to the printer? Or just rolled up close to the printer?

Physically attached to the table when you need it attached.

51. Does the table fold up and wheel away folded up?

Yes, you can fold the table up and wheel it away when you do not need it (when you do roll fed only).



The table has 5 roller bars. The original design of the table is a separate structure, but you have the option to ask for a physically attached table if you intend to work only with rigid materials.

UPGRADES, Future Improvements?**52. What features have been added, or changed since the printer first appeared?**

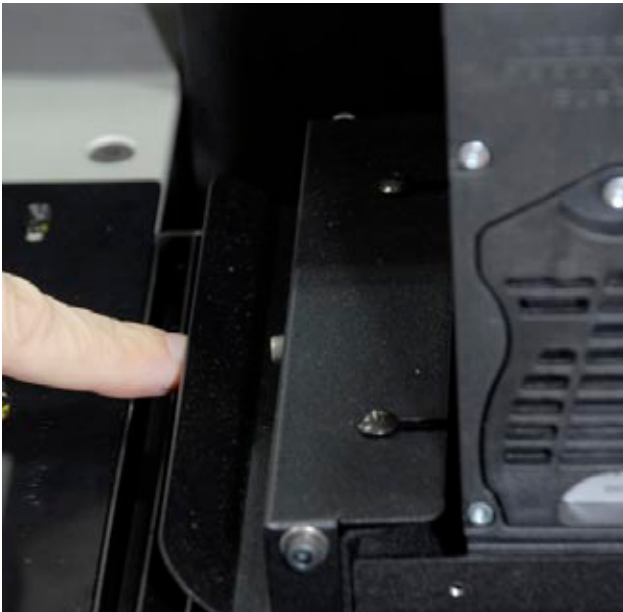
At an IP&I dealers/distributors meeting, after the printer had been displayed at ISA '07 and FESPA '07, a list of improvements was suggested. By July these improvements had been integrated into the design. They include:

- Anti-head crash system, a bumper.
- Variable zone vacuum system
- Auto-capping
- Can fire all nozzles just before printing to clean the nozzles

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

At the launch (July 2007 in Seoul), FLAAR made suggestions for a final improvement: more protection against UV lamp light. Two distributors who were visiting the factory the same week made similar request for more protection. Thus it is possible that these features may be offered before the end of the year.

One distributor suggested that if the open design were included, they would need at least an automatic stop sensor so the printer stops if someone puts their hand inside.



IP&I Cube 1606 at factory. An anti-head crash system, a bumper was one of the improvements made to the original model.

Miscellaneous

54. What moves:

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

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



IP&I Cube 1606 at ISA 07. Materials are fed by a transport belt whereas the printhead carriage moves along the printing area

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

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

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

The present model has no hood.

OPERATING THE PRINTER

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

You get a real LCD monitor. It is at least 17" and larger than monitors on some quarter-million dollar printers.

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

Yes, the monitor can be set at the angle that the operator finds most appropriate.



IP&I Cube 1606 at factory. The LCD monitor is attached to the printer but its angle can be varied by the operator.

59. Where does the operator stand or sit?

Front right.

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

No emergency buttons at the back.

Three buttons at back left:

- Media REW
- Media CCW
- Take Up

61. What controls are on either end?

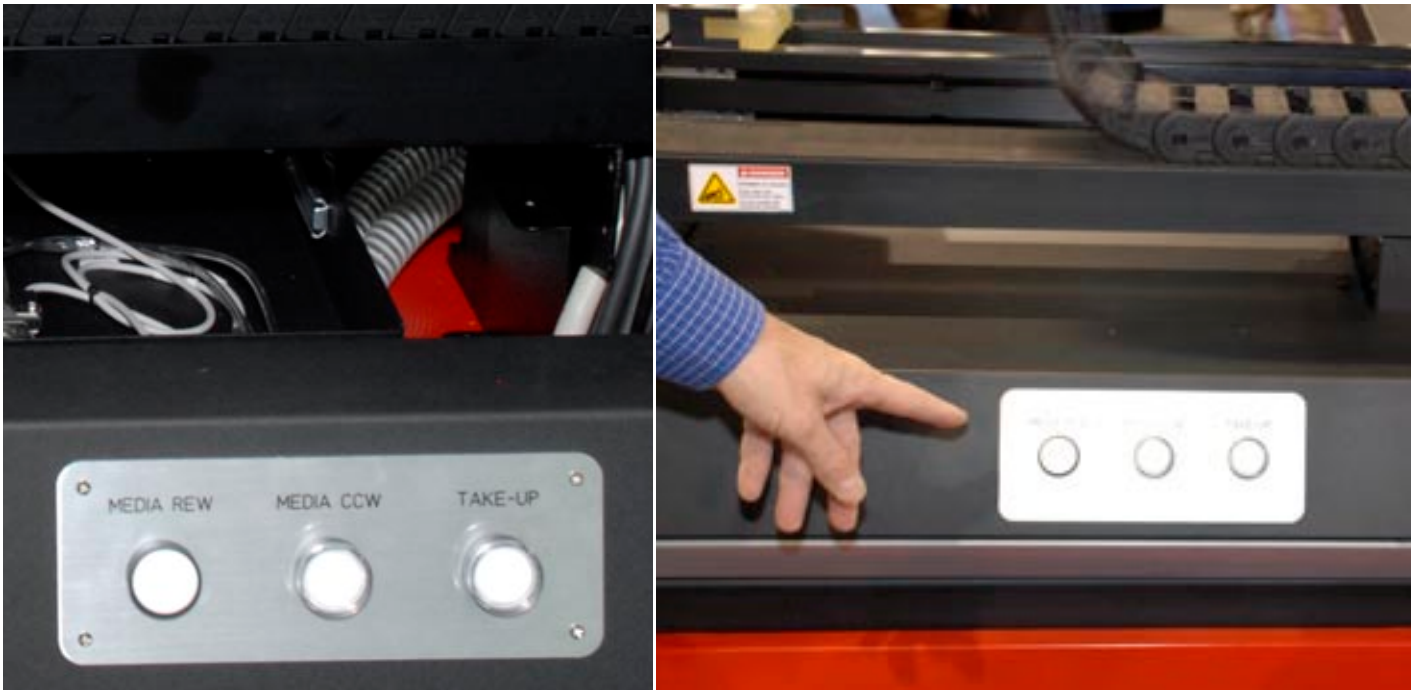
Nothing is at either end.

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

No foot pedal is included.

63. Is there a pole with beacon lights?

Most printer manufacturers do not feel that a pole with lights is an advantage. Dilli was among the first to use a vertical pole with beacon lights.



IP&I Cube 1606 at factory (left) and at ISA 07 (right). These are the only buttons you find at the back.

CONSTRUCTION (BUILD QUALITY)

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

This is a solid printer. The materials are primarily metal.

This is not a low-bid printer. They don't include cheap junk just to keep the price ridiculously low.

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

This is not a flimsy cheap printer. The edges of things are not rough, split, or chipped. Holes are not hand drilled. Screws are not at haphazard angles.

This printer is as well assembled as you would expect in Europe or Japan. Koreans take pride in their workmanship, and are not attempting to produce the world's cheapest printers by using only cheap parts.

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

This printer is solid, so does not wobble back and forth.

AESTHETICS**67. How would you describe the design of the printer?**

The printer is attractively designed. It is not industrial looking, and definitely not cheap looking.

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

You can tell which is the front because of the position of the LCD monitor.

SET-UP OF THE PRINTER: PRACTICAL CONSIDERATIONS**69. Do you need to budget installing a ventilation or room exhaust system?**

All UV printers need room ventilation, for everything from ozone to misting ink to general odor.

70. What about dust and cleanliness of the air?

Dust in the printing environment is an aspect that is often neglected. It is crucial that if a sign shop, that no sanding, sawing, 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.

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

USB.

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

Compressed Air (0.4Mpa) is used for:

- 1) Ink supply
- 2) Mechanical devices (pneumatic parts)

SET-UP OF THE PRINTER: PRACTICAL CONSIDERATIONS**73. Is installation included in the purchase price?**

Price and features vary by country. Installation will tend to be included, though food and accommodations will need to be provided for the installer.

74. How many people come for the installation?

This will depend on whether it is factory-installed, or dealer/distributor installed, and these vary by country.

75. Do people also come for a pre-installation site inspection? From the factory or from the distributor or from the dealer?

There is definitely an inspection, since the printer can't be delivered until the site is ready. How the inspection is carried out depends on the distributor and country.

INSTALLATION OF THE PRINTER

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TECH SUPPORT & WARRANTY

76. What is the original warranty period?

One year.

CLEANING & MAINTENANCE NEEDS

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

Easy.

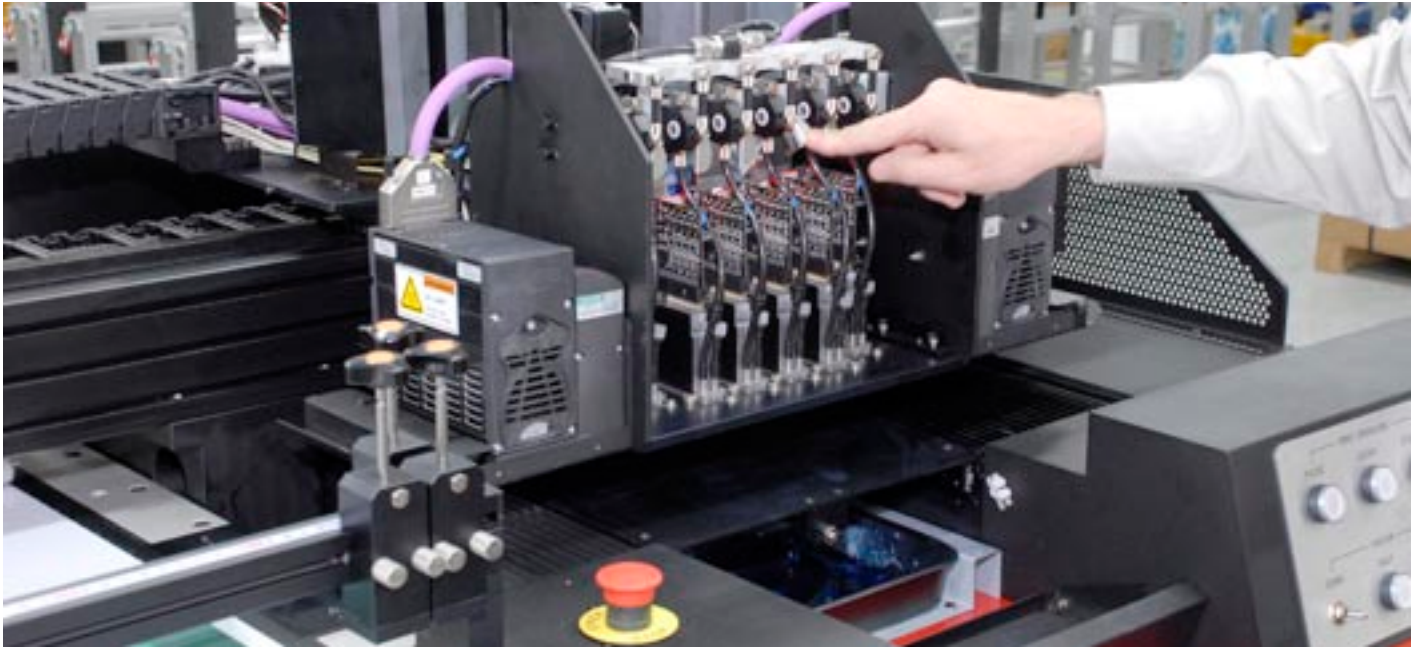
78. How is head cleaning accomplished? Spray, vacuum, manual, other?

A prime is spray (in the area at the right); a cap is sucked (in the area at the left).



79. 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?

To run cleaning solution into the heads, you raise the lever associated with each printhead (on the carriage). When the same valve is down, then ink flows into the heads.



Each printhead has a lever to run the cleaning solution into the heads

80. How many levels (strengths) of printhead cleaning (purging and/or sucking) can be accomplished via the firm-ware (software)?

You can consider a prime and a purge as two different levels.

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

Ink that is primed at the right goes into a drip tray. Ink that is sucked at the left goes into a waste bottle.



A drip tray collects the ink at right in the parking area

82. Is there a capping station?

Yes, you can clean the printhead at the same position by the vacuum generating device.

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

During the day the parking area is at the right. During the night the parking station is over the caps at the left.

84. Does this printer spit, or "weep" ("flash") at regular intervals?

No. A few UV printers do spit at the end of each pass; most do not.

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

No, but this is indeed actually done with some other UV printers.

86. Is a liquid flush cleaning solvent available as a separate on-board system?

Yes, there is a cleaning solution on-board.

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

Yes, you open and control a 3-way valve. On cheaper printers you have to inject solution with a syringe!

MAINTENANCE**88. What daily procedure is required at start up in the morning?**

Release park; this turns on the printhead heater automatically. Then do prime bar, check nozzle status.

89. What daily maintenance is required at night?

At night you press the Park button. This moves the carriage to the left and situates the printheads over their capping station. Then you turn the printhead board off. This results in no voltage and no heating. With the new firmware, all this is automatic.

90. How long can the printer sit unused?

One or two days, such as over a weekend.

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

Raise the levers to allow cleaning solution into the heads; fill the heads with solution to remove all the ink. Then press the Park button.

SAFETY & HEALTH CONCERNS**92. Is there auto-shut down? If so, what triggers it?**

No auto shutdown yet, though it is being planned.

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

This kind of safety feature has been recommended to improve the earlier version. So, yes, IP&I added safety devices in the head carriage (left and right).

94. Is the machine enclosed, or exposed?

Exposed. The most infamous exposed UV printer was the ColorSpan 72uv series. The exposed UV light and ink misting generated critique within the industry. So MacDermid ColorSpan changed all new models to be enclosed. The same happened with Gandinnovations: they seem to have clearly received messages from end-users (primarily in Europe) plus industry critique, and they totally enclosed even their two new models of flatbeds.

But in the meantime, a whole bunch of new printers came out. Their original designs had noticed the ColorSpan 72uv was wide open. So the Mimaki flatbed was exposed, the GCC 183 was exposed, and the Oce 250 was exposed.

But the Mimaki received sufficient negative comments on its exposed aspect that it completely redesigned its hood (it actually had a hood, but there was too much light leak anyway).

Now the Oce Arizona 250 GT is the most infamous exposed UV printer.

95. How easy is it to obtain the MSDS of the ink?

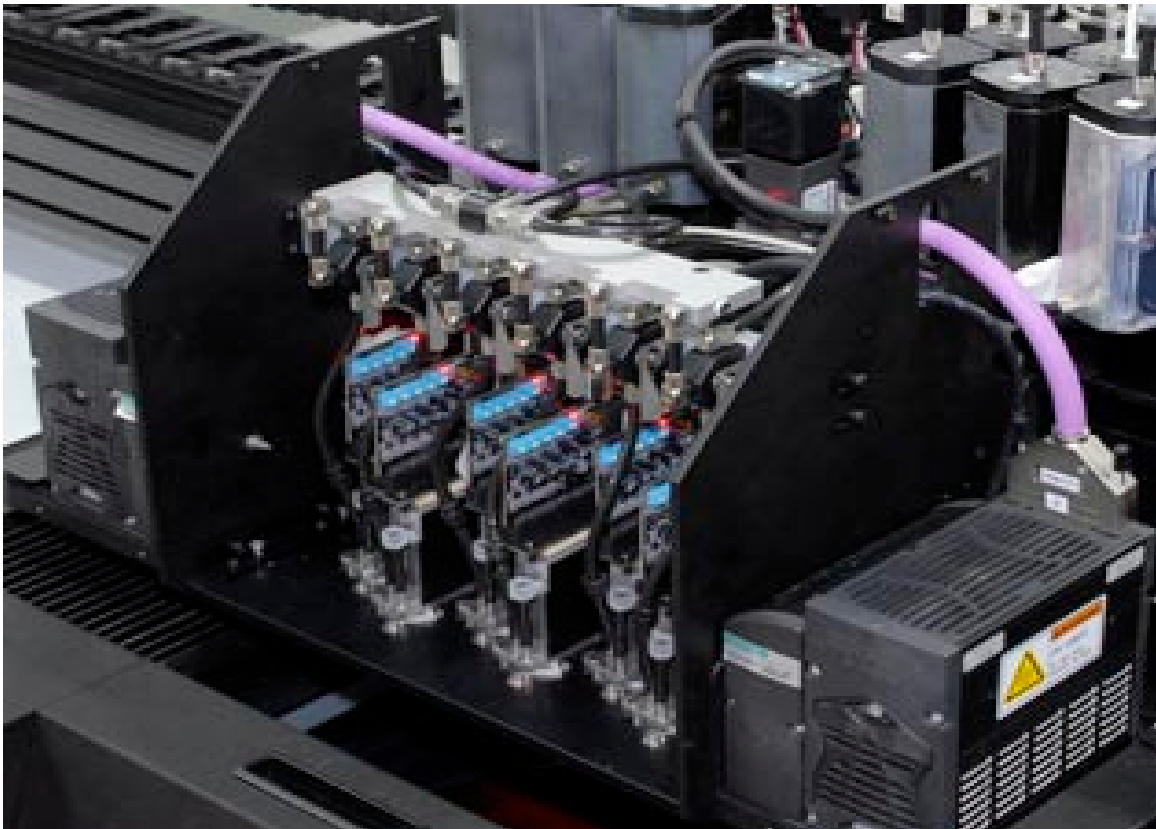
It is rare that the MSDS of the ink is easy to obtain. If the MSDS is an auto-download from the company website, this is how it should be. But most companies do not wish the end user to know which brand of ink is being used, so hiding the MSDS is not necessarily an attempt to hide the dangers, but may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

PRINthead TECHNOLOGY**96. Which brand printhead is used?**

KonicaMinolta.

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

The previous model IP&I Cube260 also uses the same printhead. It works fine.



IP&I Cube 1606 printhead carriage

98. How many nozzles per printhead?

512.

99. How many printheads per color?

One.

100. How many total number of printheads?

Four on the CMYK model and six on the CMYK+2W model and six-color model.

101. Is the printhead for the white ink the same model as the printhead for the other colors?

Yes, the same printhead is used both for color and for white.

PRINthead DPI & Features

102. What is the drop size in picoliters?

14 picoliters.

103. Is there variable droplet capability?

No.

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

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

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

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

IP&I clearly states their passes as 2, 4, 8, and 16. Production speeds are based on 4 and 8 passes.



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Bi-DIRECTIONAL VS Uni-DIRECTIONAL PRINTING

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

From right to left.

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

Approximately twice as fast.

PRINTHEAD Positioning

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

Staggered, you can see their relative positions in the positions of the capping station.



In the capping station you can see 6 pads for the printheads: CMYK, and 2 whites.

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

Motorized.

109. Is there an alarm system to stop the head from hitting substrate if head is not high enough?

There is now an anti-crash system to protect the printheads.

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

The nozzle plate is recessed.

PRINTHEAD: Associated Features**111. Can the firing frequency be varied by the end-user?**

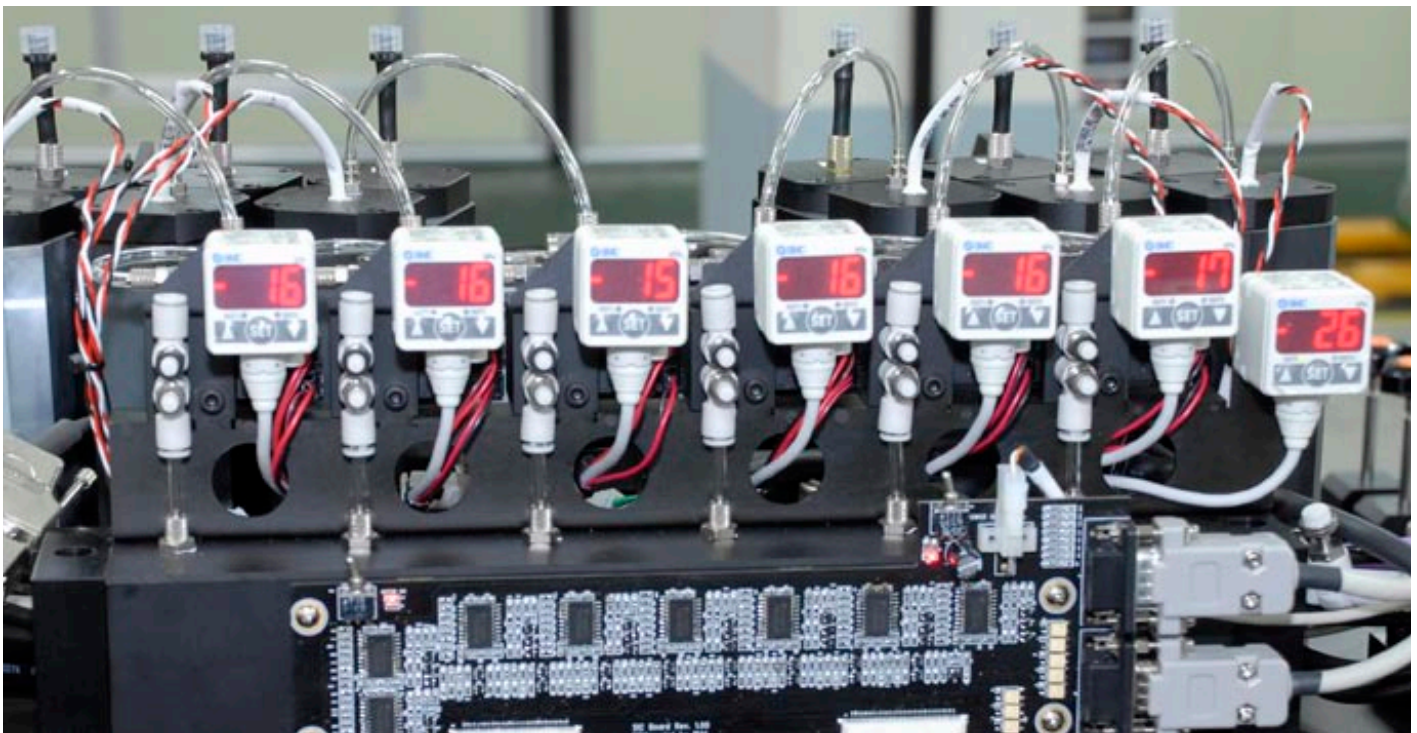
IP&I prefers that the end-user not vary this frequency.

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

Yes, as with most UV printers.

113. Is the negative pressure user variable?

Yes, for each color individually. You can see the pressure at the back of the carriage, in the clearly visible display.



Each printhead has its own digital display to indicate negative pressure

PRINTHEAD Life Expectancy**114. What is true life expectancy of this print head? Is the printhead considered a consumable?**

A printhead life is calculated based to be about 2000 hours. This is an estimate and depends on how many times you turn the lamp Off and On (called a "strike"). Each strike causes the equivalent of an hour or so of actual use (this is true for almost all UV lamps, indeed for all regular light bulbs too, to a lesser extent).

115. What else, besides a head strike, can cause a head to fail prematurely?

The same aspects as for all brands of printheads in all printers:

- Lack of proper cleaning.
- Contamination of the nozzle plate
- Voltage problems.

116. What does each printhead cost to replace?

About \$2000 + service charge.

SUBSTRATES

117. If roll-to-roll, what core diameter(s) will this printer accept?

2 and 3" cores both; adapters are available.

118. Can you adjust the rate of media feed?

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

SUBSTRATES, Issues

119. What materials can this printer print on perfectly?

Foamboard, PVC and flex banner vinyl.

120. 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?

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

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

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

"Heat can be adjusted to some degree by raising the printheads."

121. 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.

An anti-static ionizer bar is available already for the Cube260 and is being prepared for the 1606 series.



The spindle accepts 2" and 3" roll cores. But adapters are available.

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

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

SUBSTRATES: Cleaning, Priming, Preparation**123. Do you have to brush off or otherwise clean each sheet of incoming material by hand before you print on it?**

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.

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

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

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



Samples of rigid substrates. Marble (left) and glass (right)

INK**125. Is there a special ink for flexible material, and another ink for rigid material? What other inksets are available? Is there any choice in inks?**

Only one ink.

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

At present only Mimaki and Gandinnovations offer a special heat-formable UV-cured ink.

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

There are two models: 6 colors or CMYK+2W.

128. Other than white, how many spot colors are available? What about metallic colors?

Spot colors are not usually available, not on most UV printers.

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

The ink comes from Sun Chemical.



INK: White & Varnish

130. Is white ink available?

Yes, as an option. Available on CUBE 1606F model.

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

There are six ink lines, so to use white you are not able to use light cyan and light magenta. This is the same situation with most other UV inkjet printers that cost under \$300,000.

When you first order your printer model, you can choose either CMYK+2W or 6 color. Changing 6 color to CMYK+white is unavailable.

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

Two printheads. Usually one ink line is not enough to make the white opaque enough.

133. Is the white ink opaque enough?

The second printhead helps make white realistically opaque.

134. What is the shelf life?

One year for colors; 6-9 months for white ink.

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

White ink is equipped with an agitator, to keep the pigments from settling out.

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

Yes. But with the Zund 250 and some other printers the white ink is in a special location.

137. Is spot varnish available?

No, varnish is offered by many companies but usually it does not function as expected. So we commend IP&I for not offering varnish.

INK Cost**138. Does ink come in cartridges or bulk? How large are the ink containers for replacement ink?**

4 liters per box.

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

Ink price varies by country; in general ink price is less than most competitors.

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

The waste fluids container holds 4 liters.

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

Depends on usage. Since ink cost is low, emptying is not as traumatic as emptying waste container on other printers where ink cost is more.

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

You are alerted in the monitor.

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

Yes.

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

There are no protective devices, but if you use after-market ink, the warranty is voided.

INK: General Knowledge**145. How is new ink added? Pouring into the on-board container? Switching the container to the new ink container?**

Pour ink in.

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

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

INK Color Gamut

147. Which colors print best?

Typical UV-cured ink colors: best are blue, cyan, flesh, earth colors.

148. What about silver or other metallics?

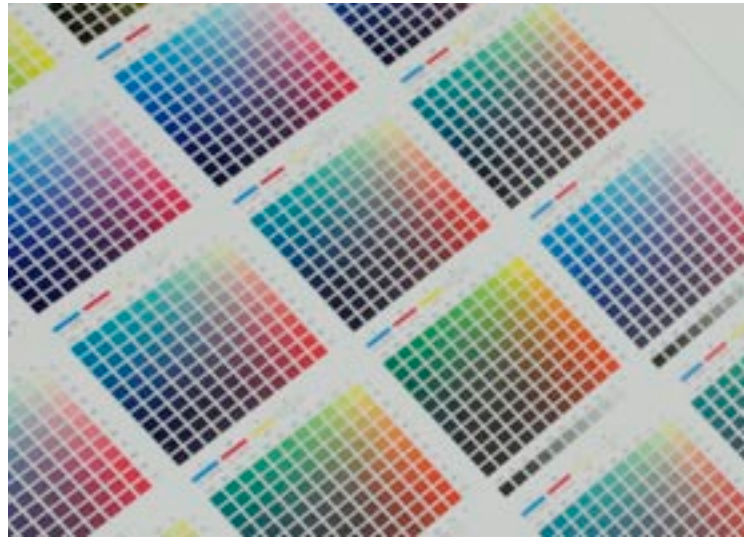
Metallic colors, such as watches, print well.

149. Which colors print poorly or not at all?

Typical UV-cured ink color issues:

- Magenta is strong
- Purple is dark
- Green has too much yellow
- Red is either too magenta, orange or dark pink.

These problems occur with UV-cured chemistry for half-million dollar printers too, so this is not an IP&I issue, but a Sun Chemical issue.



THE UV CURING LAMPS

150. How many different sets of lamps are there? Is there pinning first and then curing later?

Conventional UV lamps: direct curing with no preliminary pinning.

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

Conventional mercury arc UV lamps.



152. How many watts are the lamps?

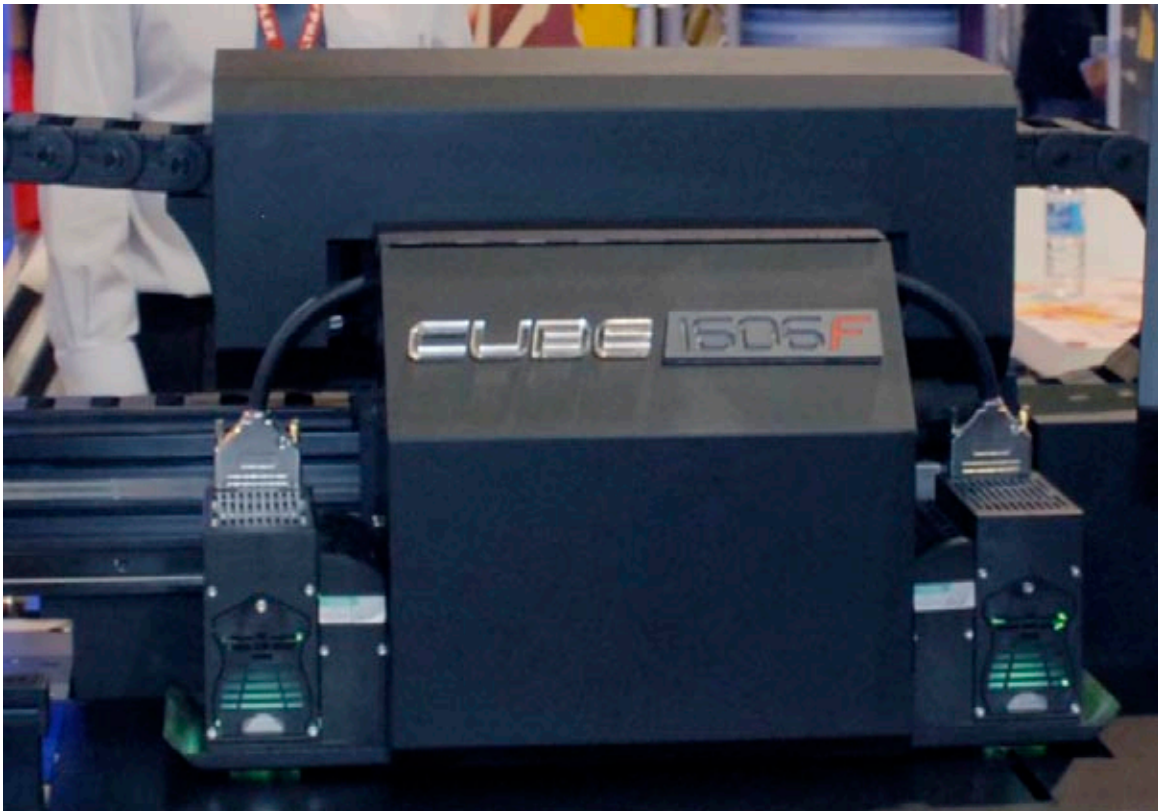
At low setting the lamps are at 60 watts; at high setting at 100 watts.

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

The lamps tend to stay shuttered at standby mode. This is a new trend, rather than having to shut the lamps off totally.

154. What brand of lamp is used?

Integration Technology, SubZero 085 ST, 8.5 cm long.



IP&I Cube 1606 at ISA 07. As in most UV printers, this model uses two lamps, at each side of the printhead carriage.

155. How many lamps does the printer use?

Two.

156. 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?

Most printers require that each lamp be on an identical setting.

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

Lamps have warranty for 500 hours; they tend to last 1000 hours. This can be 100 days or up to 6 months, depending naturally on usage patterns.

158. 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.

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

General running hours is available from the monitor interface.

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

The ink does not necessarily totally cure within seconds. Some colors, depending on how thick the ink is laid down, may cure “instantly.” But several factors may result in a cure that takes 24 hours, 48 hours, or weeks. If you set the print mode for “glossy” this reduces the lamp intensity. These prints will outgas for weeks.

UV LAMPS: Cooling**161. Are there 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.

Trailing lamp is used; forward lamp is shuttered on each pass.

162. How often do the shutters stick?

This is an issue with the UV lamp manufacturer, not with the printer. But generally a shutter will stick if it has been bent due to a severe head crash. But the new IP&I system has a head crash avoidance bumper.

163. How many fans are there per lamp?

One intake fan; one exit fan.

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

With an open system, no fans are needed.

165. What other fans are there in the printer?

There is an open grill of horizontal openings at the back lower right panel and front lower right panel.

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

Yes, there are two grilled areas where the lamps are, to help dissipate heat.

RIP SOFTWARE & Printer Software**167. Which RIPs are featured?**

Onyx and Wasatch and now Caldera

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

You need to provide your own RIP server.

COLOR MANAGEMENT FEATURES

169. What color management sensors or measuring tools are on-board?

ColorSpan has color management tools built into its UV printers, but otherwise this feature is not yet available on other brands.

ADVERTISING CLAIMS:

170. Do certain parts of the printer need to be repaired or accessed so often that you have to remove safety plates or protective plates to make access easier?

This is mainly with Chinese-made printers.

171. How often do people return this printer and say they want their money back?

Print shops who have bought some brands of Chinese-made UV printers tend to be disenchanted and want their money back.

COMPARISONS WITH OTHER PRINTERS

172. When people are considering buying this printer, what other printer(s) are they also looking at?

ColorSpan, all models, GCC, Chinese printers, and a few others.

173. What features on the other printers may be issues?

Chinese UV printers have iffy track record.

GCC 183 is hybrid and still not finished; GCC 250 uses Xaar heads, which don't offer the fine detail of the KonicaMinolta heads in this IP&I Cube printer.

Oce 250 offers no white whatsoever, and no six colors.

Main downside of Oce 250 is UV light exposure for your retinas, and potential for misted ink to escape into your work space.

174. What aspects of the selected printer help decide in its favor?

The IP&I is well made, is not a low-bid manufacturer (so parts don't fall apart within weeks). The IP&I has the most sophisticated transport belt system that I have yet seen.

SUMMARY: Image Quality Issues: General

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

Text is legible to 4 pts. The quality of this printer is one of its strong points.

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

If the material itself is glossy, the image will be at least satin.

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

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

Conclusions

Pros

Roller tables and roll-fed system are included at no extra cost. The roll-fed capability tends to be an expensive upgrade on most other combo-style printers, especially those that already cost more than this Cube 1606. So the final price is more reasonable than many competing brands.

The roller tables are a typical example of how precisely and capably these are designed and constructed. These are not cheap junk hammered together in a garage sweat shop.

Has a 4-roller system for the transport belt. I doubt most quarter-million dollar systems have this. I rate the transport belt system of IP&I as the best I have seen so far: drive roller at front top; driven roller at top back; tension roller at the bottom, balance (alignment) roller at mid-height between tension and drive roller.

The LCD monitor is larger than other printers costing up to a quarter-million dollars.

The user-interface is user-friendly, and shows most of the operating features all simultaneously (which is they the monitor is of such user-friendly size).

The ink price is so low, compared with other printers, that you might want to consider this brand on the reasonable ink price alone.

White comes in a double dose (two channels). A single channel (on other printers) is often not opaque enough.

IP&I can customize their printers for your special needs. This can be a real benefit for your special projects or unique materials.

The biggest benefit of this brand of printer is that it's not made in a low-bid sweat shop. The workers are trained and experienced pros, not cheap untrained labor with no education.

Downsides

Three downsides: needs a hood for protecting against UV-lamp light and potential misting ink. And it would help to have a slightly different UV ink chemistry so that reds were closer to reds of water-based and solvent ink gamuts. The present ink is typically UV-cured: lots of magenta and cyan, and yellow a bit green with green a bit yellow. This is the same ink on most other UV printers so the present ink is not worse than that of competitors.

Final downside is that your options are white+CMYK or six colors. To obtain six colors plus white you need the Cube260 model.

Compared with other printers we have inspected, the IP&I did well, especially in build quality.

Observations

The difference between IP&I and Oce, is that when Oce is asked why they don't protect the eyes of users from possible damage to their eye retinas, their defense is that "our printer meets EU regulations." The sensible conclusion to this is that EU inspectors clearly don't have adequate interest or knowledge in UV lamp hazards. In other words, the criteria are inadequate as is the Oce printer in this respect.

A manufacturer should provide what is best for its users, not merely do what inadequate regulations allow.

When I pointed out the same problem to Mimaki, they changed their entire hood design, significantly.

When I pointed out the same problem to IP&I, they clearly indicated they would check on this aspect. IP&I did not try to hide behind some inadequate EU standard.

Gandinnovations also totally redesigned their two new flatbed printers with enclosures. So clearly there is abundant documentation that both misting UV ink droplets and UV lamp light could be harmful. It is a lot cheaper to improve a printer up front, especially when more than one person points out the potential hazards.

This is a new printer and our inspection has been more intense than with most, since the printer was available for detailed inspection at the factory at the product launch event, plus at ISA '07, FESPA '07 and Shanghai '07.

The printer is well designed, solidly constructed, and backed by a company that cares about its reputation.

IP&I manufacturers machines what work well in printshops (as we learned when inspecting printshops that had the two previous models: IP&I Revo and IP&I Cube260uv. These are not cheap low bid printers whose sole benefit is cheap cheap price. These printers are made to last, and made to hold up to serious use.

Both printshops that I visited, that had IP&I printers, had bought a second or third IP&I printer. This is the best recommendation you can get for a brand: a successful printshop wants a second one.

Revised January 3, 2007.

First issued July 2007 after seeing this printer at two international trade shows and then spending two days at the IP&I factory. Updated August 2007, Updated October 2007.

If you need more information about IP&I, please contact:
David Yoon
davidyoon@ip-i.co.kr

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

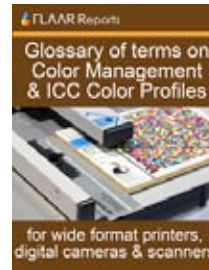
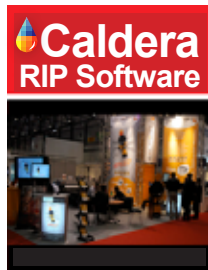
Although FLAAR is non-profit, the graphic designers who work hard to prepare this PDF for you from Nicholas's notes, and the web designers who create the web sites that attract over a 270,000 readers per year, all appreciate receiving at least a modest salary.

A small portion of our operating costs comes from selling the FLAAR Reports. But our readers don't always know what to expect, so a new agenda is to make a sample of our reports available free. So this year we are starting this new program, to request a subvention (grant) from respected members of the wide-format industry to cover the base cost of issuing the reports so we don't have to charge for them. We list every

company that provides a grant in the open documentation at the end of each report that has a grant. For us, the subvention allows more people to learn more about UV-curing inkjet chemistry and technology. That's our goal: to assist as many people as possible to learn from our experience.

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

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



These reports on RIP software and Color Management for serious UV printers are free downloads on all FLAAR web sites (follow the link to 'free downloads') http://www.wide-format-printers.net/reviews_reports_evaluations/free_download.php

RIP, COLOR MANAGEMENT, and ICC Color Profiles options

Once you have a serious UV-curable wide-format printer, you may prefer to have an equally serious RIP software and color management equipment.

The RIP software for simple water-based printers such as Canon, Epson, and HP may not be the same RIP software that could be most effective and productive on a UV-curable flat-bed or UV-cured roll-to-roll production printer.

I first noticed Caldera RIP on Gandinnovations UV printers several years ago, then I saw Caldera being used at the Mutoh Europe factory demo room in Belgium.

When I was visiting the Durst factories in Europe I again noticed that they were using Caldera RIP software.

So I requested access from Caldera so I could visit their world headquarters in Strasbourg, France, to spend several days learning more about their RIP. As a result there is now a FLAAR Report photo essay on this software.

Most recently I have seen Caldera RIP at the Shanghai printer trade show in China, at DRUPA in Germany, at FESPA Digital in Geneva, SGIA '08 and Viscom Italy '08.

When I visited a large printshop in Maribor, northern Slovenia, they were using Caldera RIP and the manager of technical services for this company said, "Caldera does a good job." This company in Slovenia has about eight UV printers (about five of them from Durst) and an equal number of large solvent printers. They originally used a GretagMacbeth color man-

agement system but switched to BARBIERI because the BARBIERI spectrophotometer can read more efficiently and can handle textiles, backlit, wood and other materials that are either awkward or difficult on other brands of color management instruments. You can learn about the BARBIERI equipment either from their headquarters in Brixen or their distributors worldwide.



Caldera also offers a highly regarded spectrophotometer from Barbieri, the leading color management company in Italy (they are headquartered in the same city as Durst, the manufacturer of Rho UV-cured printers).



For further information on Caldera contact Joseph MERGUI mergui@caldera.fr
 If you have questions about color management, if you are in the US you can contact: ImageTech at: www.ImageTechDigital.com
 Mark Spandorf (owner and president), mark@imagetechdigital.com or 510 238-8905.
 If you are in Europe or the rest of the world you can contact BARBIERI directly at: BARBIERI electronic snc, info@BARBIERIElectronic.com
www.BARBIERIElectronic.com
 Tel.: +39 0472 834 024
 Fax: +39 0472 833 845

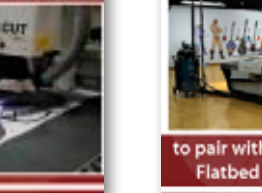
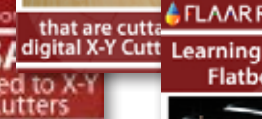
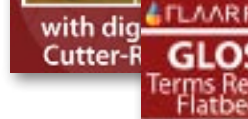
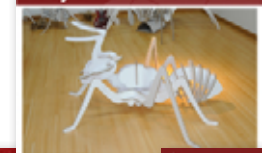
XY Cutters options



Once you have a UV-curable printer, the next item you should consider is a digital XY contour cutter-router.

FLAAR has been inspecting various brands of XY contour cutters and routers, including visiting factories where they are manufactured and doing site-visit case studies.

During October more FLAAR Reports will be issued on this subject. Here are a few photos to show you what we will be evaluating



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. In your years of wide format printing experience have encountered results different than 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.

Citing and Crediting

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

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

The material in this report is not only copyright, it is also based on years of research. Therefore if you cite or quote a pertinent section, please provide a proper credit, which would be minimally "Nicholas

Hellmuth, year, www.FLAAR.org.” If the quote is more than a few words then academic tradition would expect that a footnote or entry in your bibliography would reference the complete title. Publisher would be www.FLAAR.org.

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

Legal notice

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

Advisory

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

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

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

Or the product may indeed have a glitch but one that is so benign for us, or maybe we have long ago gotten used to it and have a 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 may 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.

Both personnel have many standard tricks that they use to make their output look gorgeous. In about half the cases you will not likely obtain these results in real life: in most cases they are printing uni-directional, which may be twice as slow as bi-directional.

Trade show examples tend to be on the absolutely best media. When you attempt to save money and use economy media you will quickly notice that you do not get anywhere near the same results as you saw in the manufacturer's trade show booth, or pictured in their

glossy advertisement. Five years ago we noticed Epson was laminating prints to show glossy output because their pigmented inks could not print on actual glossy media. The same equipment, inks, media, and software may not work as well in your facility as we, or you, see it at a trade show. All the more reason to test before you buy; and keep testing before you make your final payment. Your ultimate protection is to use a gold American Express credit card so you can have leverage when you ask for your money back if the product fails.

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 lifted by cranes and run over a rough pot-holed highway or kept in smelting 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 do 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 your 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 and 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 Lüscher 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.

Acknowledgements

With 19 employees the funding has to come from somewhere, so we do welcome project sponsorship, research grants, contributions that facilitate our educational programs, scholarships for co-op interns and graduate students, and comparable project-oriented funding from manufacturers. The benefit for the end-user is a principle called academic freedom, in this case,

- The freedom of a professor or student to speak out relative to the pros and cons of any equipment brought to them to benchmark.
- The freedom to design the research project without outside meddling from the manufacturer.

Fortunately, our budget is lean and cost effective as you would expect for a non-profit research institute. As long as we are not desperate for money we can avoid the temptation to accept payment for reprinting corporate PR hype. So the funding is used for practical research. We do not accept (nor believe) and certainly do not regurgitate corporate PR. For example, how many manufacturer's PR photos of their products have you seen in our reports or on our web sites?

Besides, it does not take any money to see which printers and RIPs

function as advertised and which don't. We saw one hyped printer grind to a halt, malfunction, or otherwise publicly display its incapacities at several trade shows in a row. At each of those same trade 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, EskoArtwork, Raster Printers (EFI Rastek), DEC LexJet, DigiFab, Barbieri electronic, Seiko II, 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, especially when FLAAR staff need to be on the road over a quarter of a million miles per year (roughly over 400,000 km per year total for the staff). Obviously this travel is hosted since unless money falls from heaven there most realistic way to obtain funding to get to the demo rooms for training is direct from the source.

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, EskoArtwork, Gerber, Grapo, IP&I, Mimaki USA, Mutoh, Dilli, GCC, NUR, Océ, Shiraz (RIP), Sky AirShip, 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 roughly every two years. 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 Hewlett-Packard ColorPro printer on our list of recommended printers, but we love our HP DesignJet 5000ps so much we now have two of them, one at each university.

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

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

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

ment 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 primary 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.

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