FLAAR Reports

November 2009

Seiko I Infotech ColorPainter

V-64s

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Contents

Seiko I Infotech Inc. booth at FESPA Digital, Amsterdam 2009.

Introduction

Many years ago the Mimaki JV3 was one of the best-selling solvent printers. Before that were several venerable models of Arizona printers, with Xaar printheads (a decade ago this is what reigned at entry-level through mid-range). Then, at the height of popularity of the Mimaki JV3, the Seiko ColorPainter 64s became one of the most popular mild-solvent printers in the world. Most of the competing printers were slow (used aging Epson printheads) and used eco-solvent or full-solvent inks.

The Seiko ColorPainter 64s was mild-solvent, the inks were beautifully saturated, and the KonicaMinolta printheads were fast. The printer became popular. FLAAR noticed this and wrote reviews on the Seiko ColorPainter. We learned that up to 15% of the people who came to a trade show booth or otherwise inquired about this printer had read a FLAAR Review.

A year later, at the height of the popularity of this printer, HP bought rights to distributorship. Unfortunately the ink price went up. The new distributor channels often had never handled solvent ink before. As a result sales of the HP version were not as high as expected. In early 2009 the relationship with HP was phased out. Very quickly a new completely Seiko H-series mild-solvent came out.

At ISA 2009, the V-version appeared. This is the subject of the present preliminary evaluation.

Experience of FLAAR with evaluating solvent inks: full, mild, lite, and eco.

FLAAR has evaluated solvent ink printers for a decade. Although FLAAR is best known for evaluating giclee and fine art photo printers, and for reviewing UV-cured grand format printers, in fact we have produced dozens of FLAAR Reports on different solvent printers, some Mimaki, several Mutoh, and various Roland (as well as earlier Seiko and HP lite-solvent printers).

It would be hard to find any other institute with this experience. Please realize that the evaluation in this report that began in summer 2009 is the first edition. We first saw the printer at ISA 2009 then FLAAR flew five of us from FLAAR to FESPA Digital Europe. We thank the personnel of Seiko and Systeam (the German master distributor) for providing the User Manuals and access to inspect the printer during the busy trade show.

The next step will be to test the printer in a Seiko demo room.

Then we will find and visit printshops that are using this Seiko ColorPainter 64s to check on how it functions out in the real world.

No trade magazine today could afford to fly staff around to evaluate printers in this manner, and besides, a trained journalist is not always an experienced printer operator. The co-author of this first report is Pablo Martinez; he has experience as the operator of a VUTEk solvent printer in his previous job.

The notes on this printer are based on inspecting it at various trade shows around the world, most recently at SGIA 2009.

THE BASICS

1. Brand name, model?
Seiko I Infotech Color Painter V-64s is the popular name. Solvent Ink Color Inkjet Printer IP-5610 is the name in the User's Guide.

2. What is the nature of the company? Is this company the manufacturer, distributor, or rebranding?
Seiko I Infotech designs printheads and printers. Seiko I Infotech does not have a manufacturing plant for the actual printer chassis.

3. What other printers are the same or similar chassis from this manufacturer or distributor? Is this same printer available elsewhere under a different name?
The exterior chassis and sheet metal is the same as the ColorTextiler 64DS.

We are checking to see the relationship between this printer and the dye sublimation printer of Seiko which was shown at Graphics of the Americas, early 2008.

That chassis was similar to the chassis used for the HP Designjet 8000s. But of course the insides, the firmware, and the ink are evolved to a more sophisticated level.

Seiko Color Painter V-64s front view.

4. How does this model compare with comparable previous printers?
This is the first of the Value line for Seiko I Infotech.
The V = Value, which is jargon for an entry-level mild-solvent printer. An approximate earlier equivalent would be the HP Designjet 8000s, which was a lower priced version of the HP Designjet 9000s (which was the ColorPainter 64s).

5. If this is a rebranded printer, what features are different than the original printer?
AssoonaswecanhavetheHPDesignjet8000sandSeikoColorPainterV-64stogetherwecancomparethemandnotethespecificimprovementsontheSeikoV-64s.

6. When and where was this model first introduced?
The Seiko V-64s was first shown to the public at ISA 2009 during Spring 2009 and to the European public a few weeks later at FESPA Digital Europe in May 2009.

7. Is this mature, or still in alpha-stage, beta-stage?
This printer is now out of beta-stage.

8. List price?
The price of the printer is still not finalized, but they recommend to the dealers 22,000 euros or $ 26,000.

9. 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?
The printer includes an Ink cartridge set.

10. What other equipment is needed to operate this printer? For example, does this printer include its own power line conditioner?
No, it doesn´t include its own power line conditioner, but includes an external dryer.

11. Do you need an uninterruptible power supply (UPS)?
No, you don´t need a UPS to handle the printer.

12. Do you eventually need or wish to buy an auxiliary heater?
The printer comes with an extra blower, to help in the drying process. The blower provided by HP three years ago was judged by some end-users as not being sufficient (don't blame me, this is what most printshop owners specifically told me when I saw the old blower and asked about it). Thus we will check to be sure that the new blower is improved.

The printer comes with an extra blower, to help in the drying process. The blower provided by HP three years ago was judged by some end-users as not being sufficient.

WHAT IS THE INTENDED MARKET FOR THIS PRINTER?

13. What is the market that the manufacturer has designed this printer for?
The V-model is for value, to compete with the lower priced eco-solvent printers but still provide you with more bang for your buck. Seiko has appropriately decided to focus on performance, and not cheap low-bid machines.

PURCHASING

14. Are dealers national (most companies) or regional (Roland allows a dealer to operate only within a limited regional area)? Does a buyer have any choice in dealers?
In the US dealers tend to sell locally and regionally. Some larger dealers sell nationally. In the rest of the world the situation varies by region. In France the distributor is Oce.
Whether a dealer is national or regional depends to some degree on the size of the country, and which country. The Seiko printers are available throughout North America and Europe, as well of course as Japan and Asia.

15. What kinds of leasing or other financing are available?
Seiko doesn't sell directly to the final user, they provide the printers to the distributor or dealer, so the financing that might be available depends on the dealer.

STRUCTURE OF THE PRINTER

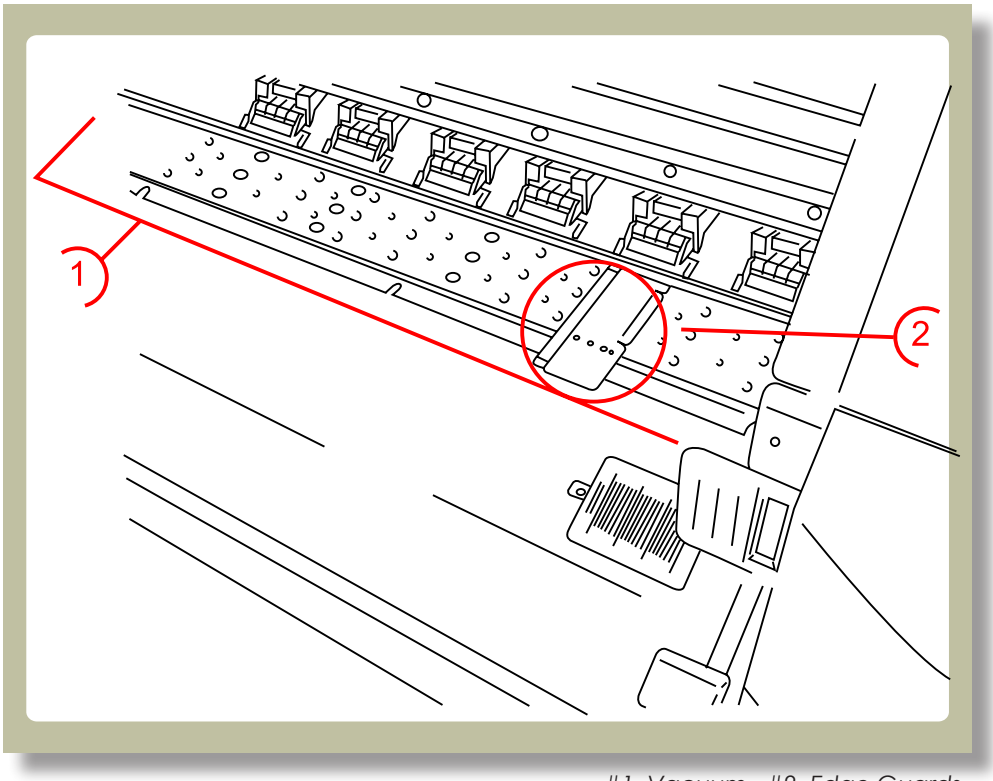
16. Is this printer made originally as a solvent ink printer, or is it retrofitted with solvent ink? If retrofitted, what was the original brand?
This is a second generation mild-solvent printer. This printer is made from the ground up for solvent ink.

17. If there is a vacuum function?
The printer includes a vacuum system that draws the media down onto to the platen. The vacuum can be set at low or normal mode.

18. In how many sections?
This is located only in the platen area.

19. Are there edge guards (media clamps)? At left, or at right, or both?
You can find the media edge guards at both sides of the media.

20. Can you move the left guard, or the right guard, or both?
Yes you can move each edge guard.



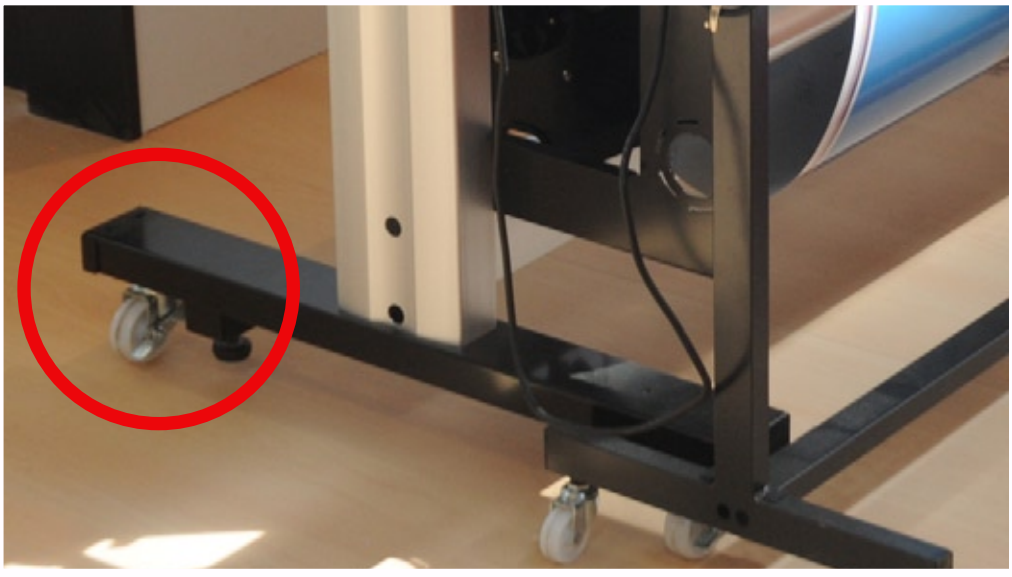
#1. Vacuum #2. Edge Guards

21. Does the printer have levels built into the structure of the printer?
Solvent printers do not need to be as perfectly level as a UV-curing printer, so it is not customary to have bubble levels actually built into the printer.

22. 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?).
Cleverly the carriage stops where the image ends.

23. Does the printer have leveling supports? How many, and how strong?
Behind the printer It has one leveling support on every side: one on the back right, the other at the back left.

24. Does the printer have wheels? Are they robust?
The printer has two wheels at each side, making a total of four wheels.


Leveling support and wheels

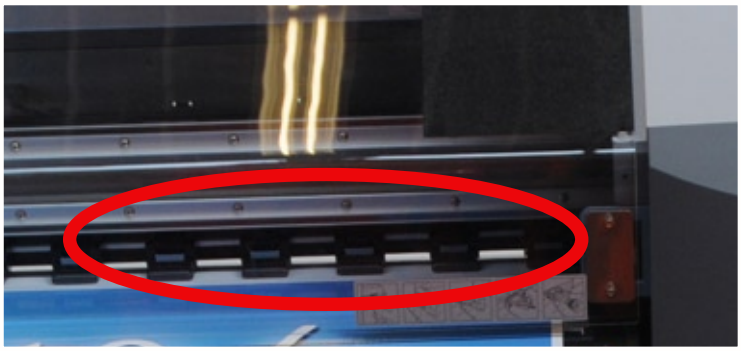
ROLL-FED ASPECTS

25. How is roll media fed? Pinch roller against grit roller?
The grit roller advances or rewinds the media under pressure from the pinch roller.

26. Are the pinch rollers same size as grit rollers, or smaller?
Pinch rollers are a few millimeters smaller than grit rollers. There are 19 pinch rollers and 19 grit rollers. Each pinch roller is directly above a grit roller. The grit rollers are about 1 mm wider than its corresponding pinch roller.

27. Are the grit rollers continuous or individual?
They are individual, and, there is no continuous roller unit that is visible on the surface of the platen.

28. How are the pinch rollers raised as a unit?
At the front and behind the printer there is a lever that can be raised to adjust the pressure of the pinch rollers.



The grit roller advances or rewinds the media under pressure from the pinch roller.

29. Can one individual pinch roller be raised to get it off the material, say, at an edge?
No they can´t.

30. Can the pinch pressure of the pinch rollers be varied?
Yes you can adjust at:
No pressure: This the normal UP position.
Weak: The pressure force becomes weak.
Normal Pressure: When loading the media, lower the lever.

You can adjust the pinch pressure at No pressure, Weak or Normal just pulling up or down the pressure lever.

31. Can you load the roll in the middle, or does the system encourage you always to load the roll with the right end at the far right of the printer?
You can load in the middle. The HP 9000s prompts you to align media to the left.

32. How is the roll held at the feeding position? On a spindle? On a saddle?
The roll is held on a spindle. A saddle is used to hold substrates primarily on 5-meter printers. Old cores (or cores damaged in shipment and handling) tend to be a problem on a spindle.

33. Is there an air (pressure) core system?
There is no need for an air pressure core-system on a 64" printer. Air-core systems are most commonly found in 3-meter printers or wider.

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35. At the back, is there an extra roller bar(s) near the platen? 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 extra roller bars are needed

36. How is the roll media handled at take-up position? For example, is there a dancer bar?
Yes, at the front there is a dancer bar that creates the tension.

37. What about the take-up reel? Does it work unattended? Is it motorized?
In the lower side at the front there is a motorized take-up roll.

38. What is the media path?

The path of the substrate is up and over, so is not complicated. You load from behind, and the media goes directly to the print area. Media can be collected by the take-up system, or it can be free fall. Media that is going to be rolled by the take-up unit needs to be taped down to the take-up spindle.

39. Front loading, back loading?

- Back loading, up fairly high (other solvent printers load down near the floor). To load a fresh roll, you open the Front cover and slide the media edge guards to each ends of the platen. Then, close the Front cover.
- Install the flange spacer to the flange at the right hand side.
- Raise the pressure roller up / down lever.
- Feed the media between the pressure roller and grid roller and advance the media until the leading edge of media comes out of the Front cover.

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

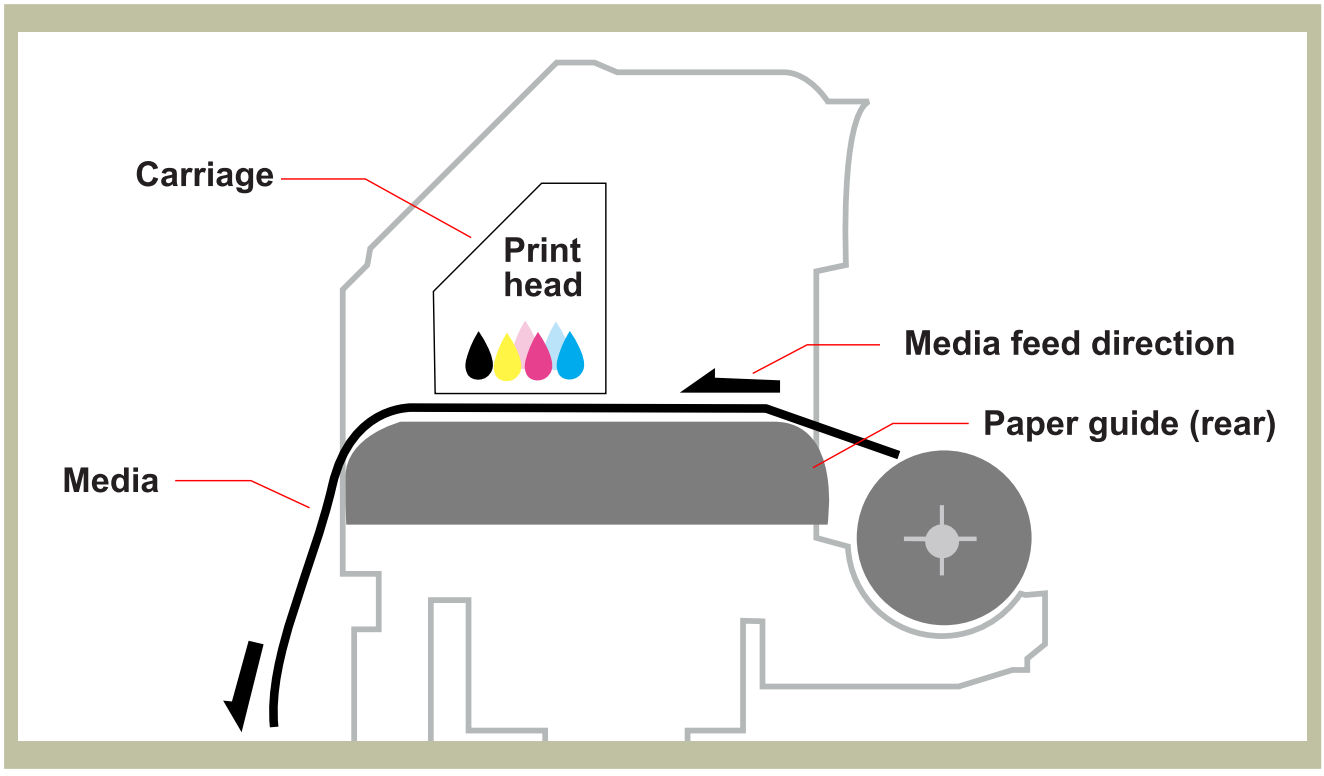
In the front side It has a manual media cutter blade.

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

The cutter is in the lower platen side, before the dancer bar.

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

It is not a good idea to cut near the platen because, in general, detritus from cutting anywhere near the platen can be a factor in printheads clogging.



The machine has a simple path. You load from behind, and the media goes directly to the print area.

HEATERS & DRYER

43. What about heater or dryer? Is there a pre-heater, platen heater and post-heater all three, or just one, or two? How many heaters does this printer have?

The printer has three heaters: Front heater, Print area heater and Rear heater.

44. Where are the heaters located? Is heater on top of, or under, the media?

- Behind the platen area is the rear heater that preheats media.
- At the platen area is the print heater that penetrates ink into media to fuse the ink.
- At the front after the platen area is the front heater that drives off the solvent in the ink to stabilize print quality.

45. Can you turn an individual heater on and off without turning off all of the others?

Yes, you can turn an individual heater ON or OFF.

46. Can you vary their temperature?

Yes, at the control panel you can vary the temperature of each one. You can also vary the dry time in the panel.

47. Is an auxiliary heater or fan offered, or needed?

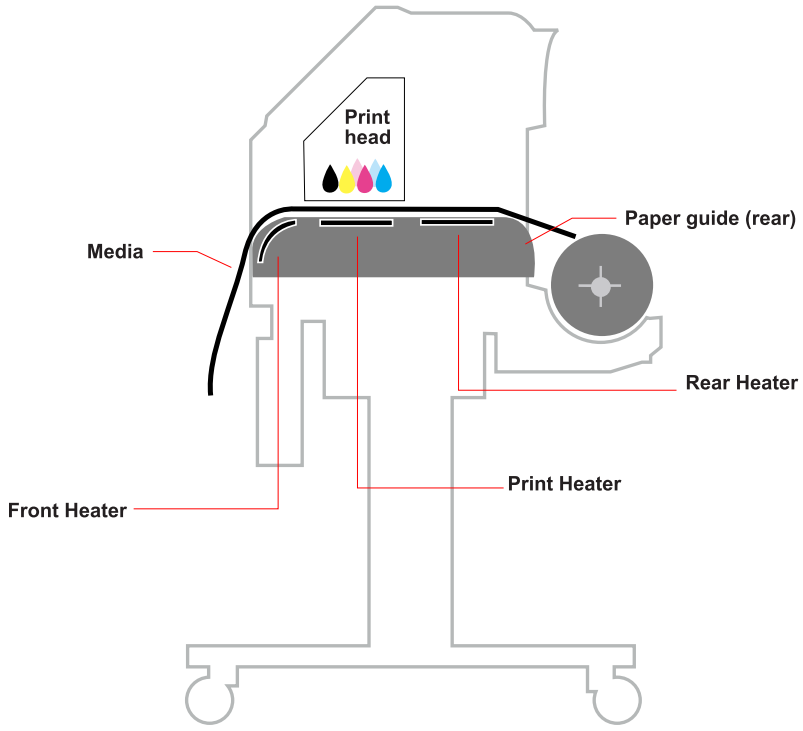
The printer includes a extra blower unit to help dry the material.

48. Heat concerns: what heat settings are needed for special substrates?

Media type	Media selection	Print heater	Print heater	Rear heater
Glossy vinyl chloride	Glossy	45ºC	40ºC	45ºC
Matte vinyl chloride	Matte	45ºC	40ºC	45ºC
Tarpaulin	Banner	45ºC	40ºC	45ºC

You can save up to 20 media profiles in the printer.

The printer includes a extra blower unit to help dry the material.



OPERATING THE PRINTER

49. What features have been added, or changed since the printer first appeared?
Nothing, it´s a brand new printer.

OPERATING THE PRINTER

50. In the main area for operation, is the machine software based (touch screen), or with physical control buttons? Or both?
The printer uses physical control buttons, located at the control panel.

51. Do you get an LCD screen in the printer or a real computer monitor? How big is the screen or monitor?
At the front of the printer in the right side there is a two-line LCD screen.

52. Is the position of the LCD screen or monitor user-adaptable?
No, the display screen is fixed into the printer, so it can't be moved.

53. Can you do unattended printing? For how long? How about overnight?
Yes, as long as the printer has media.

54. How many operators or operator assistants does this printer require?
One person is capable to handle the printer.

At the front of the printer in the right side there is an LCD screen, where the operator can control a lot of printing options.

55. What can you control, as operator?
At the control panel, you can control:

- The MEDIA
- MEDIA ADV VALUE
- DRY TIME VALUE
- PRINT MODE
- PRINT DIRECTION
- FLATTEN TIME
- EDGE GUARD
- MEDIA ADV MODE
- TUR MODE
- LEADING EDGE
- VACUUM LEVEL
- FRONT HEATER
- PRINT HEATER
- REAR HEATER
- COLOR STRIPE
- IMAGE GRADIENT
- PH HEIGHT
- BIDIR ADJ1 (L)
- BIDIR ADJ1 (R)
- BIDIR ADJ2 (L)
- BIDIR ADJ2 (R)
- BIDIR ADJ3 (L)
- BIDIR ADJ3 (R)
- IMAGE IMPROVE
- PH CLEANING
- BACK ADJUST VAL
- ADVANCE PREF
- PRINT MODE PREF
- HEATER PREF
- PH REST PERIOD
- PH REST TIME
- PH TEMP REST

56. Where does the operator stand or sit?
The operator stands at the front of the printer at the right side where the control panel is located.

57. What aspects of the printer can you operate from behind (the loading area)?
You can control the pinch pressure.

58. What is at either end?
There are no controls at either end of the printer.

59. Is a foot pedal included (for operating aspects of the printer)?
No, the printer doesn´t have a pedal to operate the printer aspect, everything is handled at the control panel.

CONSTRUCTION (BUILD QUALITY)

60. What is the solid-ness of the construction of the outer body? Is it plastic? Metal? Heavy gauge?
The structure is a mixture of plastic and metal that gives the printer a solid structure but also makes it lightweight.

61. Is there both a front hood and a back hood?
There is a front hood and no back hood. At the back there is only a slight open space to allow the media to pass through.

62. The hood, is it strong, or cheap plastic?
The hood appears to be clear Plexiglas-like material. It is of adequate strength so that it does not wobble and sag (hoods on some brands of Chinese printers are such cheap material that they sag).

63. Is the frame plastic or metal?
The front hood has a frame behind (for attachment) at both sides and a frame across the top. The top frame is an aluminum-like material.
The advantage of having no frame across the bottom is that you can see the printed material without obstruction.

64. Does the printer wobble back and forth when printing?
Most printers shake when the carriage reaches the end of its path and immediately starts its next run in the opposite direction. But the Seiko wobbles significantly less than the Gandinnovations solvent printer that costs three or four times (or more) the cost of the ColorPainter V-64s. In other words the V-64s has less wobble than many other printers.

65. What sensors does the printer have?
Take-up sensor, Paper ejection sensor, waste tank level, leading edge sensor.

The structure is a mixture of plastic and metal that gives the printer a solid structure but also makes it lightweight.

AESTHETICS

66. How would you describe the design of the printer?
The ColorPainter V-64s appears better organized than the old ColorPainter versions of several years ago. The design also looks more modern and professional because there are no silly dinosaur-era ink cartridges sticking out at the front or back.

67. Can you easily tell which is the "front" and which is the "back'?
The shape and functional design make it easy to recognize which is the frontal part and which is the back side.

SET-UP OF THE PRINTER: PRACTICAL CONSIDERATIONS

68. What is the delivery time, between the time I order the printer and it is delivered?
Depends on the dealer stocks.

69. What are the electrical requirements of this printer? This means, will the building have to be rewired.
AC 100-127 V / 220-240 V

70. Is the power auto-switching, one or the other, or do you have to switch the power yourself with a manual switch?
You have to manually switch off the power.

71. Are there any special temperature or humidity requirements or preferences of this printing system?
Temperature : 15 °C to 30 °C (60 °F to 86 °F)
Humidity : 30% to 70%

To obtain better print quality, use the printer within temperatures of 20 to 25 °C (68 °F to 77 °F.)

72. What is the connectivity? Network, SCSI, FireWire, USB 2, or other?
USB 2.0

73. Is any outside air pressure required to be provided to the printer? Is this for a vacuum table, or other purposes (such as ventilation)?
No, it is not required.

74. How many boxes arrive?
Two boxes, one with the printer stand and another with the dryers.

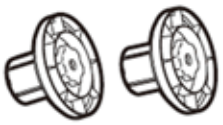
75. What comes in the box?
- 1 Roll media
- 2 Flanges (3" diameter each)
- 2 Flange spacers
- 1 Head of printheads
- 1 set of ink cartridges
- 1 power cable
- 1 USB 2.0 cable
- 1 maintenance kit
- 1 Hex wrench
- 1 Wiper sponge
- 1 Media cutter blade
- 1 Spanner
- 1 Phillips screwdriver
- 1 Waste ink bottle
- 1 User's guide.

76. What is the size and weight of the printer?
External dimension 112" x 33" x 50" (2.83 x .83 x 1.255 meters) Weight 484 lbs. (220 kg.)

77. Realistically, how much surrounding and support space will the equipment need in addition to the machine's own footprint. What space is needed to accommodate not only the printer but everything else to make the printer fit into your workflow?
You will need a space of 3650 mm (144 inches)(W) × 3830 mm (150 inches)(D) × 1800 mm (71inches)(H) for installation.

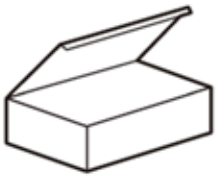
You need a surrounding and support space of 3.65 m. (144 inches)(W) × 3.83 m. (150 inches)(D) × 1.80 m. (71inches)(H) for installation.

Roll Media (for adjustment)
<1 piece>

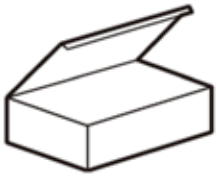


3 inch flange
<2 pieces>

Flange spacer
<2 pieces>



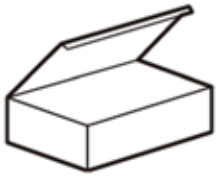
Print head set
<1 set>



Ink cartrige set
6 colors (C, M, Y, K, Lc, Lm)
<1 set>

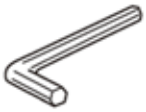
Power cable
<1 piece>

USB2.0 cable
<1 piece>

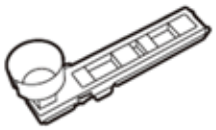


Daily maintenance kit
<1 set>

- Cap Cleaning Liquid: 300 ml/ 1PC
- Wipe Cleaning Liquid: 200 ml/ 3PC
- Cleaning Swab : 10 pieces
- Cap Cleaning stick : 1 piece
- Cap Cleaning roller : 30 pieces
- Tweezers : 1 piece
- Wiper blade : 1 piece



Hex wrench
<1 piece>



Wiper sponge
<1 piece>

Media cutter blade
<1 piece>

Spanner
<1 piece>

Phillips screwdriver
<1 piece>

Waste ink bottle
<1 piece>

User´s Guide
<1 volume, this guide>

Items that come in the ColorPainter V-64s printer box. Image extracted from the Seiko I Infotech Inc. User´s Guide, ColorPainter V-64s page i (Solvent Ink Color Inkjet Printer IP-5610).

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- 1 Wiper sponge
- 1 Media cutter blade
- 1 Spanner
- 1 Phillips screwdriver
- 1 Waste ink bottle
- 1 User's guide.

INSTALLATION OF THE PRINTER

78. Can you install this printer yourself?
Seiko I Infotech recomends that somebody trained installs the printer.

79. How many manuals are available?
Two, the User´s Manual and the Quick Reference Guide.

80. Is there a Site Preparation Guide? If so, is it helpful?
No, there is no preparation guide.

81. Is there a glossary in the User's Manual?
No, there is no glossary at the User´s Manual.

82. Is there a Service Manual?
Yes, there is one but only available for the dealers and technical support personnel.

83. What kind of cut-away drawings or other drawings exist that show the various parts of the printer?
The manual has nice and clear drawings to explain parts and procedures.

Most of the times a good drawing is better than a manual with photographs, because the drawings can be zoomed in without distortion.

TRAINING

84. Is training included in the purchase price? If so, what kind of training is offered?
That depends on the dealers.

TECH SUPPORT & WARRANTY

85. What is the original warranty period?
One year for the printer and six months for the print head. You are warned not to use accessories or products other than those provided by Seiko. If you do, this action invalidates the warranty.

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

PRINTHEAD Technology

87. What printheads are used? Xaar, Spectra, Epson, Konica, Seiko or other?
The earlier Seiko ColorPainter 64s printers used KonicaMinolta printheads. It is more likely that the newer H-series and V-series ColorPainter printers use Seiko printheads.

88. How many printheads per color?
One printhead per color.

89. How many printheads in total?
Six printheads in total (C,M, Y, K, Lc, Lm.)

90. Do you have to maintain negative pressure on the printhead?
Yes, you have to mantain negative pressure.

91. Can you regulate this pressure yourself?
No you can´t regulate this pressure.

PRINTHEAD Positioning

92. Are printheads at an angle, or in a row?
The printheads are displayed in a row.

93. Are printheads in a single row, or staggered?
The printheads are displayed in a row.

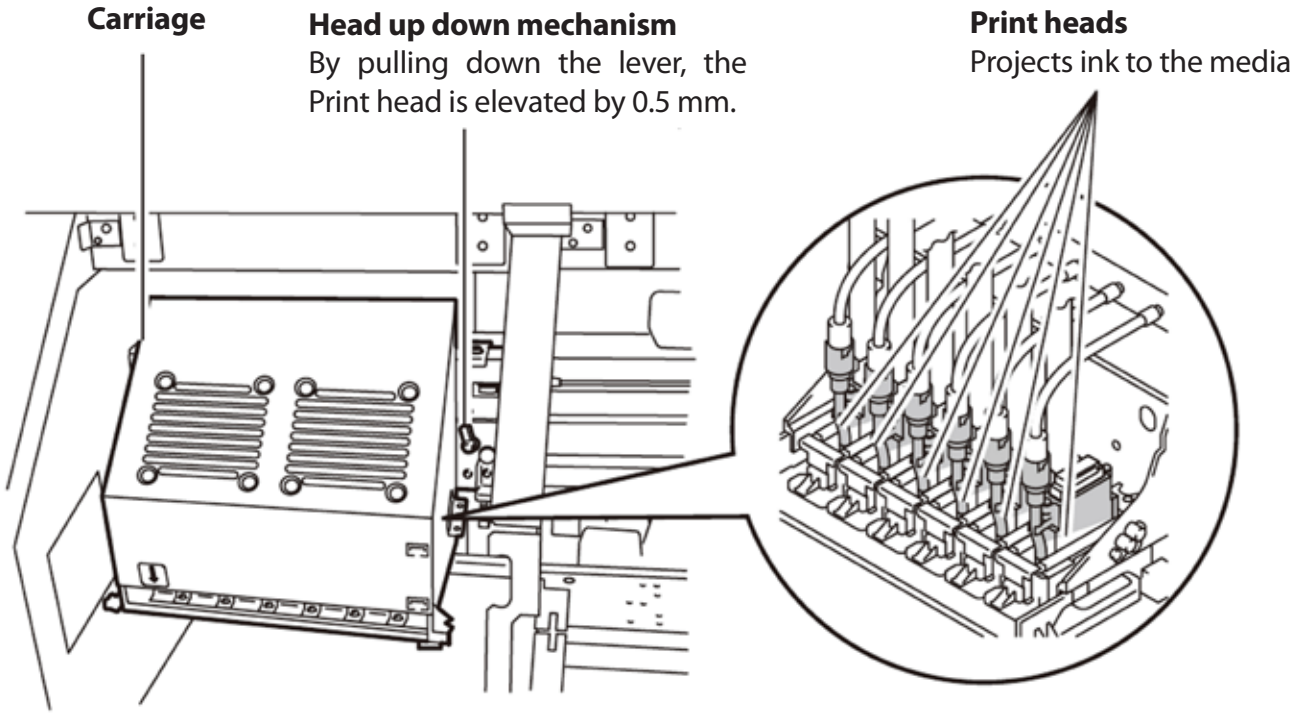

Image extracted from the Seiko I Infotech Inc. User´s Guide, ColorPainter V-64s page 1-6 (Solvent Ink Color Inkjet Printer IP-5610).

PRINTHEAD DPI & Print Quality

94. What is the drop size in picoliters?
12 picoliters.

95. How many nozzles per color?
512 nozzles

96. How many nozzles per color?
512 nozzles

97. What is the advertised DPI, and is it true dpi or "apparent" dpi? How is dpi presented (with what adjectives)? How is this dpi calculated?
True 720 x 720 dpi.

98. How many print modes are offered?
The printer offers six different print modes:

- Draft (2 passes),
- Fine draft (4 passes),
- Normal 1(4 passes),
- Normal 2 (4 passes)
- Quality (8 passes)
- Density (8passes).

99. How many passes can this printer achieve?
At quality mode the printer could achieve 8 passes.

What is rated speed at
Draft: the printing speed is two times the normal 1.

Fine draft: the printing speed is the same as the normal 1.

Normal 1: This the print mode that will mostly be used. The input data of 720 ×720 dpi is printed in the resolution of720 × 720 dpi.
Normally, use this mode.

Normal 2: the printing speed is 30 % slower than in normal 1.

Quality: the printing speed is slowed down to about one half of normal 1.

Density: the printing speed is slowed down to about one half of normal 1.

100. What is the quality like at one pass? Taking the various speeds that your printer advertises, please explain the quality or defects of the output of your fastest speed? What does the output really look like and is this sellable quality? Is the output at fastest speed junk or throw away, or would a Fortune 500 client actually pay for it and be pleased.
Draft: Prints the paper feed amount adjustment pattern at every 0.1% step between current setting value ± 0.2%.

101. Do you print bi-directional or uni-directional?
The printer could print at bi-directional and uni-directional mode.

PRINTHEAD Banding Issues

102. Is there banding in areas of solid black?
At VISCOM Paris 2009 there was no banding in areas of solid dark colors (which otherwise are the areas most prone to band).

PRINTHEAD Life Expectancy

103. Is there an alarm system to stop the head from hitting substrate if head is not high enough?
The Mimaki JV5 has the best system I have seen so far to avoid a head strike. Unfortunately the same Mimaki JV5 has too many other issues and glitches elsewhere.

104. Can you vary the gap (the distance from the printhead to the media, which is the distance the ink droplets must fly?
The head height has two levels: 0.08" (2.1 mm) or 1" (2.6 mm). Also, at the right side of the printhead carriage there is a small toggle that lets you raise the carriage by 0.5mm.

105. How can head strikes be avoided?
If the roll is loaded for a long period of time, the edge of the substrate can wrinkle, which can cause head strikes. There is a Media Flatten Time function to avoid wrinkles caused by humidity.

CLEANING & MAINTENANCE

106. How easy is it to access the area where you have to clean the heads?
Cleaning station is very accessible. Just open up the main front hood and then the cap cover.

107. How is head cleaning accomplished? Spray, vacuum, manual, other?
The wiper blade removes foreign particles on the surface of the printheads.

108. Does the machine automatically periodically purge itself?
There is a function called PH Cleaning, which has 3 modes or settings.

- Start & End, which performs automatic cleaning before and after the print job.
- During Print, executes automatic cleaning at intervals while the machine is printing.
- During Print2, it is basically the same function, but cleaning is stronger. The downside of this mode is that the colors may vary after the cleaning.

109. Is there a capping station?
The capping station is located at the right side of the printer.

110. What is the nature of the service station?
The service station has the wiper blade and the capping area, which prevents the nozzle of the printheads from drying.

111. Where is the service area? At the left, or at the right?
The service station is located at the right side of the printer.

112. Where is the parking area? Is the service area the same as the parking area?
The parking area and the service station are located at the right side of the printer.

113. What daily maintenance is required if you print the entire day long?
Check the waste ink bottle,

- check the wipe cleaning liquid.
- check the stain on the wiper blade.
- then implementation of the sample print that checks the nozzles

Wiper blade
It removes foreing matters on the surface of nozzle of the print head.

Capping unit
It prevents the nozzle of the print head from drying.

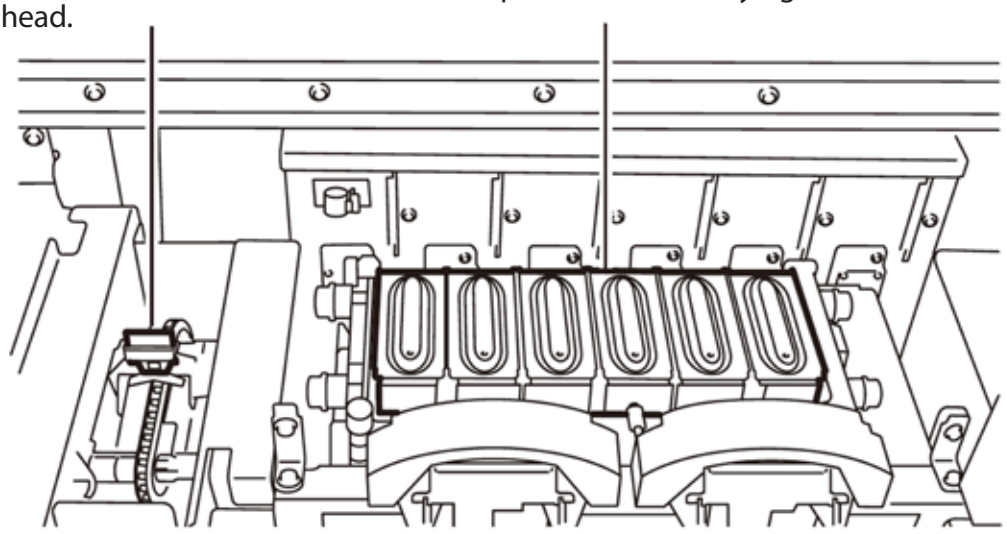

Image extracted from the Seiko I Infotech Inc. User´s Guide, ColorPainter V-64s page 1-6 (Solvent Ink Color Inkjet Printer IP-5610).

SLEEP MODE & STORAGE

114. How should a printer be prepared for sitting unused for a long time?
To prevent the print head from drying, it needs to be filled with storage liquid. After finishing the service clean, turn off the power of printer while the cartridges of storage liquid are inserted in the ink cartridge slots. Then, leave the printer.

115. When you go to wake your printer up after several days not using it, what do you need to do that's special?
Clean the Print head and the ink path using the Cleaning liquid.
After implementing the head wash, the printer needs to be filled with 6 color inks.
To fill the ink, insert the cartridges of 6 color inks.
After filling the inks, leave the printer as is for 1 hour at least.
Then, implement the nozzle print.

SAFETY CONCERNS

116. Are emergency buttons present, and if so how many, and where are they situated?
No, there is no visible emergency button.

117. Is the machine enclosed, or exposed?
The gantry area is enclosed, as are most solvent printers up to 74" except the old ColorSpan Gator (72s).

118. What other fans or exhaust openings exist in the printer?
There is one roundish grill opening at the back above where the ink cartridges are located. There is another comparable roundish grill opening at the back right. There is a square vent opening (with grill covering) at the back towards the right end.

119. What is the noise level?
At Paris VISCOM '09 the printer was not making objectionable noise.

120. Do the printer specs list the noise level?
Standby : 45 dB(A) or less, Operating : 65 dB(A) or less (Continuous sound).

121. How easy is it to access 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.

INKS

122. How many kinds of ink are available?
One kind of ink is available, a mild solvent ("lite" solvent is essentially the same; there is no industry-wide fixed definition).

123. Is this a full-solvent, mild or lite-solvent or eco-solvent?
This is a mild-solvent printer. "Mild" and "lite" are considered synonymous. Perhaps eight years ago, when eco-solvent first came out, Mimaki withdrew it's planned eco-solvent printer because the top manager of Mimaki USA at that time said that the first generation eco-solvent ink was unacceptable and would cause such user backlash that it would damage the brand name of their company.

124. Is white ink available?
White ink is not really available for solvent inkjet printers. Roland and Mimaki offered eco-solvent white ink for a while but most people commented that it was not opaque enough when it first came out circa 2003. Today, in 2009, the Mimaki white eco-solvent ink is better.

125. Other than white, how many spot colors are available? What about metallic colors?
If you need actual silver ink, a German company makes metallic ink; they exhibited this ink at FESPA 2009. But frankly most regular inks reproduce silver (watches and table silverware) and gold and most metallic colors quite nicely without needing any special spot color.

INK Cost

126. Does ink come in cartridges or bulk?
The ink came in 6 cartridges, one for each color.

127. How do you add the new ink?
Just change the ink cartridge in its specified color.

128. Where do you add the ink? Front or back of the printer?
When you change the ink cartridge you make it at the back of the printer (when facing the back the ink area is at your left).

129. How do you see the ink levels?
At the LCD screen in the control panel you can easily check the ink level.

130. Where is the waste ink container situated?
At the lower right side is located the waste ink bottle.

131. How often does the waste container need to be emptied?
The printer automatically calculates waste ink with a counter and displays the message in the display panel.

132. How do you know when the waste container is full?
The control panel shows a message, also you can view the ink full level in the waste bottle because is located in the lower right side of the printer.

133. Where is the ink waste container? Is there one, or two?
The printer has only one waste container that is located at the lower right side is located the waste ink bottle.

The waste ink container is located at the lower right side of the printer, you can check the waste level at the control panel or directly at the bottle.

INK Color Gamut

134. What colors can you achieve easily and nicely?
At VISCOM Paris '09 the image being printed had nice reds, purples, pinks. I will be checking other images at SGIA. Seiko has a reputation of offering the best and brightest color of any mild-solvent ink.

INK: Miscellaneous

135. What about ink drying time?
At VISCOM Paris '09 the ink was dry by the time it came out from under the hood. This was a pleasant surprise compared to some other solvent printers.

136. 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)?
It may help to have the band of printed colors along one edge of the media, although this is not an absolute requirement, many printshops do use this option. At VISCOM Paris '09 the images had the color band at the left.

SUBSTRATES

137. What sizes of material can be printed on?
Maximum media length:164' (50m)
Maximum media width: 64" (1.626 mm)

138. What is print width relative to roll width?
We have this entry because some printers are called "3.2" because they accept substrates that are 3.2 wide, but the printer can actually print only 3.1 meters. In such a case the model name is misleading (and incorrect in a sense).

Print width	Material width	Claimed by how the model is named
	64"	V-64s

139. What core diameter(s) will this printer accept?
The printer comes with flanges that accept a 3" diameter core, but you can buy an optional set of flanges for 2" cores.

140. How about maximum roll diameter or weight?
Maximum media Weight: 53 lb./ 24kg
Maximum media diameter: 7" (18 cm)

141. Is printhead height adjustment available? Manual? Automatic? How much?
You can setup the head height at two levels: 0.08" (2.1 mm) or 1" (2.6mm).
The process is manual.

142. How much media is wasted in starting a new roll?
About one meter. But this printer was designed so that the feeding spindle is located very near of the printing area. That way you save the media you would have wasted if the feeding spindle were located in the traditional lower area. Besides, there is an Origin Setting function, that allows you to print very close to the edge of the media.

SUBSTRATES: Issues

143. What materials does the manufacturer recommend to use this printer for?
Uncoated and coated PVC, banners, backlit film and other media designed for solvent printers.

144. Can the sensors on this printer detect transparent media (such as some backlit material)?
Although there is no actual sensor to detect transparent substrates, among the print modes you will find the Density mode, that is ideal for FF, transparent vinyl chloride.

SUBSTRATES: Image Quality

145. Do you get roller marks on some media? Which media? How bad are the marks?
No roller marks on the material being printed while I was inspecting the printer. Naturally whether or not you get marks from the path of the pinch roller depends on the pressure of the pinch roller, what substrate you are printing on, and how high your ink load is.

APPLICATIONS: What Questions should the printshop owner ask of himself?

146. Can you print fine art photos, giclee, or décor?
Yes, the print quality is good enough for photo realistic and for décor.

147. Can you print on textiles or fabrics?
Yes, the Seiko V-64s can also print on textiles or fabrics if the fabrics have a backing to keep the ink from passing through. To print on unbacked textiles requires a trough.

148. What other kinds of applications can you print?

- Billboards (good on most materials)
- Banners, general signage (good on most materials)
- Exhibit graphics; acceptable for exhibits if you need longevity in the sun.
- This I need to check, because in past years Mimaki, Mutoh, and Roland were judged by printshops as not good for backlit because of lack of saturation from their generation of piezo printheads. In those years you needed a thermal printhead to get enough saturation. Today in 2009 printheads and firmware have improved, but I would want to ask in a printshop to see if clients like a piezo printed backlit if they see a thermal printed backlit side by side.
- POP; yes, quality is good enough for Point of Purchase advertising.
- Bus shelters, yes.

Image Quality Issues Relative to Applications

149. What about abrasion (scratch) resistance? How susceptible is the ink to abrasion?
Even when freshly printed I was not able to scratch off the ink with my fingernails. Try a bio-solvent printer; that may scratch (though they do have new and better generation of ink). Many kinds of UV ink scratch off.

150. Is text sharp or fuzzy? What is the smallest text that you can easily read?
In the examples seen at FESPA 09, the text can easily be read at a 10 point size.

151. Is misting observable?
The way you can tell whether your printer has an issue with misting is to put a white napkin inside the printer. See if it turns colors from ink mist landing on it.

Or, look under the media edge guard. If the area to the right (where mist can land) has a faint barely perceptible gray or other light color, that is misting ink that has landed there.
The most misting I have seen is from the old ColorSpan 72UVX and the Infiniti uv printer.

RIP SOFTWARE

152. How many other RIPs work with this model of printer?
The printer is compatible with Caldera, Onyx, Sai and Wasatch RIP software.

GENERAL CONSIDERATIONS

153. What will the resale value of your printer be in three to five years?
Will either the brand name or model specifications cause a knowing buyer three years from now to shy away from your printer or cause a knowing buyer to only want to pay a very low price as compared to the other printers our company is considering? A company which is no longer in business may cause printers of that brand to lose value in the used market. Or is there some major technological breakthrough in your brand that will result in less value for your current model?

Seiko II is in good health as a corporation and has an excellent brand reputation.

COMPARISONS WITH OTHER PRINTERS

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

At VISCOM Paris 2009, a printshop person came up to say hello and say that he had been reading the FLAAR Reports for several years. He said he recently bought a new printer to replace three Mutoh Rockhoppers that did not hold up to 24/7 usage.

Actually he said they did not even use them 24 hours a day, but the printers simply did not hold up to constant use every day all week. He said he printed between 50 and 75 square meters a day and was told that these printers were made for only 20 square meters a day (these figures all sound low). But the point is, these European-made Mutoh printers did not hold up if kept at work all day every day.

This is the same experience we were told by users of Mutoh Toucan in past years: that if you tried to use them all day long they broke down. Ironically another printshop bought one of these Toucans from the printshop that got rid of one because it did not hold up, and said that when he used them only a few hours a day that they worked okay.

This is a long way of saying that I have not yet heard of this kind of problem with the Seiko printers, but I definitely intend to check printshop owners as soon as I can undertake a site-visit case study.

155. What features on the other printers turn them off?

The Mimaki JV5 got off to an unfortunate start in the beginning because the ink could not dry fast enough. Every year I have been told it is better, that they have new ink, but yet still, in 2009, a person went to the Mimaki demo room and wrote back that the ink still was not dry enough when it came out of the printer (of course it will eventually dry later….when it all outgases…). I find this disappointing that this is still an issue and disillusioning that so many distributors of this printer have reassured me that the inability to dry the ink had been resolved. At VISCOM Paris '09,while talking with someone in the aisle, they also mentioned the ink drying issue as well.

I did not notice any ink drying issue with the Seiko V-64s.

Pablo Martínez, member of FLAAR staff, interviewing the technical suppport specialist for Latin America Omar Mendez about the ColorPainter V-64s.

Seiko ColorPainter V-64s front view at Seiko I Infotech booth at SGIA New Orleans 2009.

Conclusions

Pros
The colors are bright and nicely saturated, which is what is important for signage.

This is a new and improved model based on several years experience with their earlier models of solvent printers.

The ink is dry to the touch when it comes out of the printer, so it is better dried than prints from some other brands. I could not scratch off the ink even with my fingernails.

No banding, not even in areas of solid dark color (naturally this depends on how the printer is maintained and what print mode you are using).

No splotchy appearance (no mottle). Printers costing four times the price of the V-64s produce images with splotchy surface textile because they are acceptable only for billboards. The V-64s is acceptable for Point of Sale and close-viewing.

Another beneficial feature of mild-solvent ink is that blacks are beautifully saturated. One complaint against latex ink is that on some materials specifically the black ink is too matte.

The latex ink printer reality (what is promised vs what downsides they may have) is still not resolved. Latex ink has some advantages but many "unknowns." FLAAR is keeping watch on latex ink but at present an advantage of mild-solvent is that it is a known quantity (so there are plenty of end-users to ask about mild-solvent ink performance, applications, and advantages, so you don't find out everything really discouraging only after you buy the printer).

Downsides
I have been working around the world taking notes on dozens of brands at trade shows in Africa, China, and Europe, and as soon as I can land in a city where I can access the V-64s in a printshop, then I will undertake a site-visit case study. So as soon as I learn of downsides and issues (all printers have something that is not perfect), I will list such aspects in a future update.

At present the only comment I would make is that the LCD screen is the antiquated small size that allows only two lines of text. In this respect ColorSpan LCD size of the last years (before being bought by HP) were significantly larger and hence more user friendly.

Conclusions
Seiko has issued one of the more recent models in the world of mild-solvent printers. This model will have a successful life span because UV printers are very very expensive. Mild-solvent ink is significantly prettier colors and offer more dramatic colors as well. There are no comparative tests of longevity (because of the expense involved) but I would not be surprised if mild-solvent ink lasted longer with nice colors than UV-cured ink.

First issued November 2009

Reality Check

Being a university professor for many years does not mean we know everything. But intellectual curiosity often leads us to enter areas that are new to us. So we do not shirk from entering areas where we are obviously not yet expert. If in your years of wide format printing experience have encountered results different that ours, please let us know at ReaderService@FLAAR.org. We do not mind eating crow, though so far it is primarily a different philosophy we practice, because since we are not dependent on sales commissions we can openly list the glitches and defects of those printers that have an occasional problem.

FLAAR and most universities have corporate sponsors but FLAAR web sites do not accept advertising, so we don't have to kowtow to resellers or manufacturers. We respect their experience and opinion, but we prefer to utilize our own common sense, our in-house experiences, the results from site-visit case studies, and comments from the more than 53,000 of our many readers who have shared their experiences with us via e-mail (the Survey Forms).

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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.

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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.

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Legal notice

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

Advisory

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

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

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

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

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

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

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

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

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

But even when we like a product and recommend it, we still can't guarantee or certify any make or model nor its profitability in use because we don't know the conditions under which a printer system might be utilized in someone else's facility. For ink and media, especially after-market third-party ink and media, it is essential that you test it first, under your conditions. We have no way to assure that any ink or media will be acceptable for your specific needs in your specific print shop. As a result, products are described "as is" and

without warranties as to performance or merchantability, or of fitness for a particular purpose. Any such statements in our reports or on our web sites or in discussions do not constitute warranties and shall not be relied on by the buyer in deciding whether to purchase and/or use products we discuss because of the diversity of conditions, materials and/or equipment under which these products may be used. Thus please recognize that no warranty of fitness or profitability for a particular purpose is offered.

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

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

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

Results you see at trade shows may not be realistic

Be aware that trade show results may not be realistic. Trade shows are idealized situations, with full-time tech support to keep things running. The images at a trade show may be tweaked. Other images make be "faked" in the sense of slyly putting on primer without telling the people who inspect the prints. Most UV inks don't stick to all materials; many materials need to be treated.

Or the UV prints may be top-coated so that you can't do a realistic scratch test.

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

Trade show examples tend to be on the absolutely best media. When you attempt to save money and use economy media you will quickly notice that you do not get anywhere near the same results as you saw in the manufacturer's trade show booth, or pictured in their glossy advertisement. Five years ago we noticed Epson was 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 lifed by cranes and run over a rough pot-holed highway or kept in smeltering heat or freezing cold during shipment.

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

Availability of spare parts may be a significant issue

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

Lack of Tech Support Personnel is increasing

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

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

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

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

Counterfeit parts are a problem with many printers made in China

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

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

Many materials don’t feed well through hybrid (pinch roller on grit roller systems) or combo UV systems (with transport belts). Banding, both from poor feeding, and from bi-directional (lawnmower effect) are common on many UV-curable inkjet printers.

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

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

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

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

Be sure to check all FLAAR resources

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

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

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 incapabilities 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, Oce, 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 Heweltt-Packard ColorPro printer on our list of recommended printers, but we love our HP DesignJet 5000ps so much we now have two of them, one at each university.

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

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

So it's obvious that providing products or even a grant is no shield from having your products fail a FLAAR evaluation. The reason is clear: the end user is our judge. The entire FLAAR service program is to assist the people who need to use digital imaging hardware and software. If a product functions we find out and promulgate the good news. If a product is a failure, or more likely, needs some improvement in the next generation, we let people know. If a product is hyped by what an informed user would recognize as potentially false and misleading nonsense, then we point out the pathetic discrepancies very clearly.

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

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

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

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

It is not our fault if some printers are more user friendly, print on more media than other brands. It is not our fault that the competing printers are ink guzzlers, are slow beyond belief, and tend to band or drop out colors all together. We don't need to be paid by the printer companies whose products work so nicely in both our universities on a daily basis. The printers which failed did so in front of our own eyes and in the print shops of people we check with. And actually we do try to find some redeeming feature in the slow, ink gulping brands: they do have a better dithering pattern; they can take thick media that absolutely won't feed through an HP. So we do work hard at finding the beneficial features even of printers are otherwise get the most critique from our readers. Over one million people will read the FLAAR Information

Network in the next 12 months; 480,000 people will be exposed to our reports on wide format printers from combined total of our three sites on these themes. You can be assured that we hear plenty of comments from our readers about which printers function, and which printers fail to achieve what their advertising hype so loudly claims.

An evaluation is a professional service, and at FLAAR is based on more than 11 years of experience. An evaluation of a printer, an ink, a software, laminator, cutter or whatever part of the digital printing workflow is intended to provide feedback to all sides. The manufacturers appreciate learning from FLAAR what features of their printers need improvement. In probably half the manufacturers FLAAR has dealt with, people inside the company did not, themselves, want to tell their boss that their pet printer was a dog. So printer, software, and component manufacturers have learned that investing in a FLAAR evaluation of their product provides them with useful return on investment. Of course if a printer manufacturer wants only a slick Success Story, or what we call a “suck up review” that simply panders to the manufacturer, obviously FLAAR is not a good place to dare to ask for such a review. In several instances it was FLAAR Reports that allowed a company to either improve their printer, or drop it and start from scratch and design a new and better one.

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

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

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

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

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

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

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

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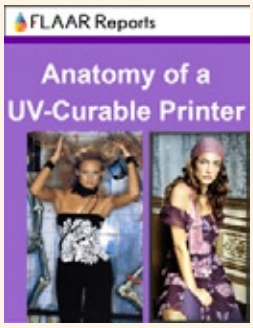
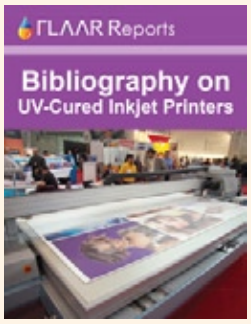
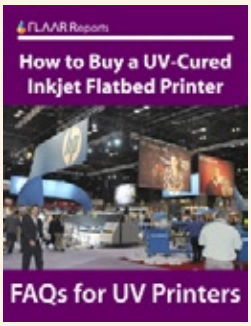
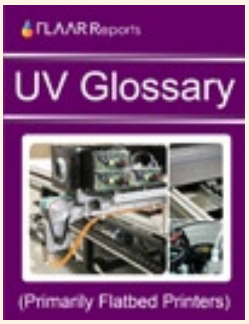
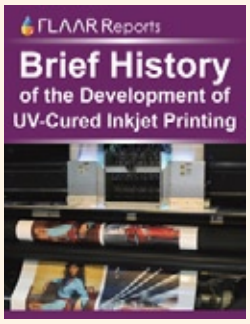
Introduction to UV Curable Inkjet Flatbed Printers

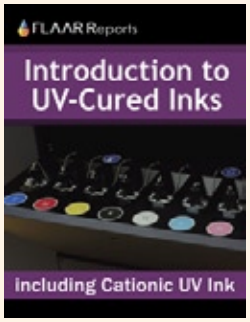












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