Affordable Dedicated Flatbed Printer with Roll-to-roll System

SKYJET

FlatMaster+Roll

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Photo in cover: Skyjet FlatMaster+Roll printer at APPPEXPO 2010

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Affordable Flatbed Printer
with Roll-to-Roll System

SKYJET *Flat*Master+*Roll*

Introduction
In recent years there has been a trend in wide-format inkjet printers towards diversification of materials on which they can print. For example the Matan Barak printers, which at first sight might seem dedicated roll-to-roll printers, do come with accessory tables for rigid media up to 1 inch thick. The HP Scitex XP2700 is another roll-to-roll printer equipped to handle rigid boards. Not to mention the increasing number of dedicated flatbed printers being equipped with roll-to-roll mechanisms. True flatbeds, as they are called sometimes, from Oce, Gerber, Mimaki, SwissQprint, and some others now offer roll-to-roll mechanisms to widen the possibilities of applications with your flatbed printer.

System Design:
But not all of these manufacturers approach the roll-to-roll mechanism in the same way. Currently, flatbed printers with roll-to-roll mechanisms can be divided according to their design. In the first system design, media is loaded at the back of the printer, pass it on top of the flatbed area, printed, and taken up at the front. Models with this roll-fed design are:
  • Mimaki JFX-1631
  • SwissQprint Oryx and Impala.

Rear view of the SwissQprint Impala UV flatbed printer at FESPA 2010. In this model roll media is loaded at the back.

The disadvantage of this style is that you waste too much media webbing it from the back up to the front. There is also the risk of media skewing, because of the long path it has to travel to be collected. Some people in the industry argue that you don't waste media in this system design because roll media is left stationary, while the gantry does all the moving in Y axis.

In the second style, the loading, printing and take up all happens at the front. Models using this style include
- Skyjet FlatMaster+Roll
- Oce Arizona flatbeds
- Gerber ion and CAT
- InkTec Jetrix
- Teckwin TeckStorm
- Grapo Gemini

This is a better design since you waste considerably less media loading it because everything is compacted very close. In this style, roll media moves forwards and the gantry is stationary while the printhead carriage moves in X axis. Printers with this roll mechanism style tend to be more expensive because software, mechanics and electronics need a configuration to offer two print modes:
- **Rigid mode**, where the gantry moves in Y axis and printhead carriage moves in X axis.
- **Roll mode**, where gantry is motionless at the front, and media is moved by roll mechanism while printhead carriage moves in X axis.

Sky Air-Ship went the correct direction by choosing the second style for their flatbed printer with roll-to-roll feature.
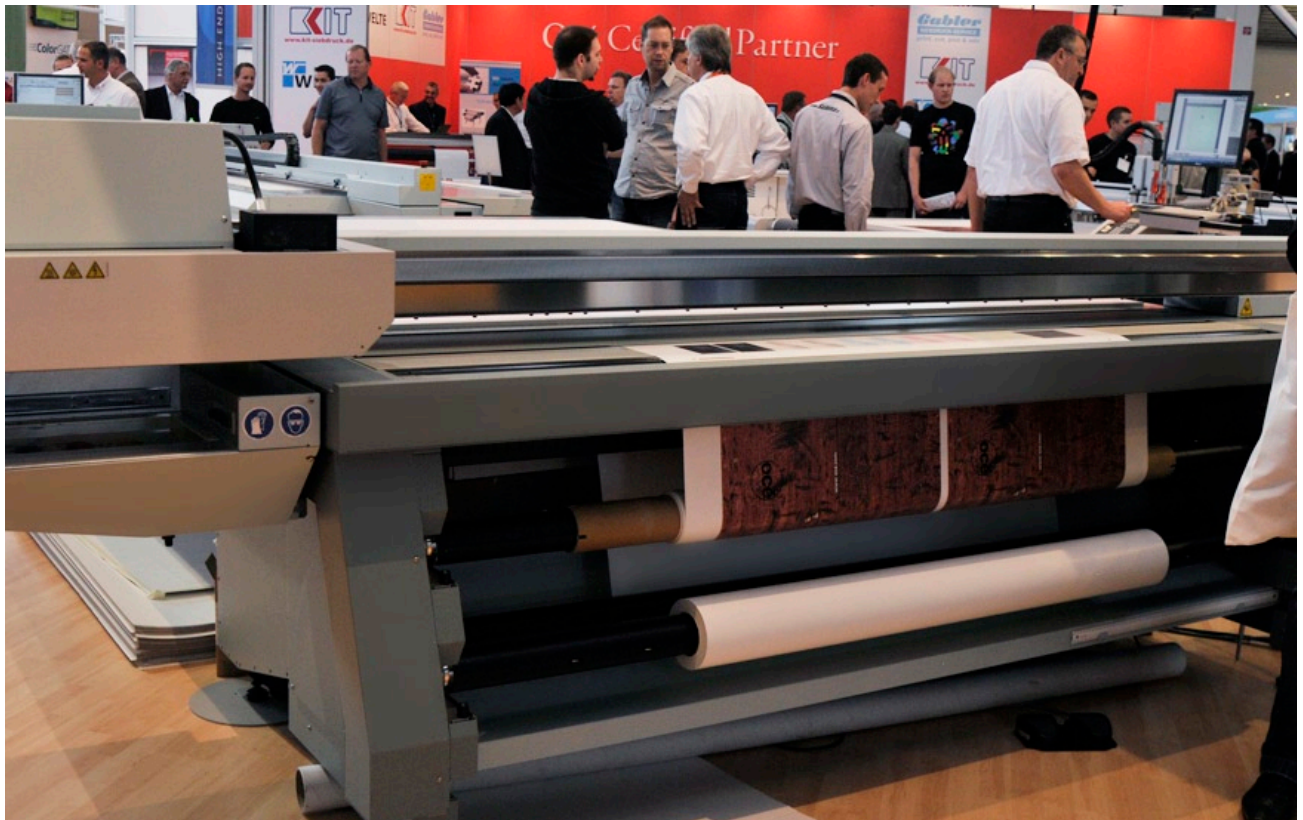
Océ Arizona 350 XT dedicated flatbed with roll-to-roll mechanism at FESPA 2010. You waste less media in this system design because the feeding roll is closer to the take-up roll than in the previous design.

Price:

The other aspect to be taken into consideration for these systems is price. Some of the companies mentioned above offer the roll-to-roll option for a reasonable price under US$15,000. Even in the new Oce Arizona 550GT, the list price is US$189,900 and the RtR +White ink upgrade raise the price to US$225,000. Grapo offers the roll-fed feature for €10,000 (around US$12,700) But in other cases, roll-to-roll option alone is offered for US$80,000! You could buy a separate roll-to-roll UV printer for this price.

Ideally the roll-to-roll option should be offered for a price lower than the price of a dedicated roll-to-roll printer, simply because the best option to print flexible media is a dedicated roll-to-roll printer.

The Basics

1. Brand name, model?

SKYJET FlatMaster+Roll.

The series name of previous dedicated flatbed models from Skyjet are FlatMaster and GlassMaster.

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

The Skyjet flatbed models come in three widths: the FlatMaster 2512, the FlatMaster 2518, FlatMaster 3018.

In this new model, the gantry has been installed across the wider side of the printer. Previous models were larger than wide, but in the FlatMaster+Roll the width is the biggest dimension. Printing speed can be faster when the gantry is across the widest dimension of the printer. Gandinnovations printers were also always printing the full width, which is the most efficient way to print.

Besides the fact that the FlatMaster+Roll comes with the roll-to-roll mechanism, there are other engineering upgrades explained further on.

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

Sky Air-Ship is the manufacturer based in Shenyang, China. Skyjet is the brand name for the printers. These printers are not being rebranded at the moment, though earlier models of Skyjet are indeed sold by other Chinese companies under different brand names (see the FLAAR Reports on Dongguan Chinese sign expo).

4. What other printers of other brands are comparable?

At the moment there are several UV flatbed printers with roll-to-roll option, such as the Oce Arizona series and their Fujifilm versions, the InkTec Jetrix,, the SwissQprint Oryx and Impala, and several others.

One of the main advantages of the FlatMaster+Roll over these other models is the price. Skyjet's flatbeds have a price considered entry-level.

5. When and where was this model first introduced?

This model was first shown at APPPEXPO Shanghai 2010, but a similar model was shown at Dongguan 2010, although without the roll-to-roll system. It was similar in the sense that the gantry was installed in the wider dimension.

FLAAR has visited the Skyjet factory twice in recent years. From left to right, Mark Ma, International Sales Manager (in blue shirt), Jonathan Ho, distributor for Singapore and Malaysia, Nicholas Hellmuth, FLAAR Senior Editor, Mr. Liang Jiang, president of Sky Air-Ship and Ms. Wang Hui, General Manager of Sky Air-Ship. In an upper stair, a technician from India visiting Sky Air-Ship for training.

6. Is this printer mature or still in alpha-stage or beta-stage?
These first notes are being written a month after the launch in APPPEXPO. At this moment, the printer is still in beta-stage.

7. List price?
US$52,000 is the price for the version that includes 7 colors. (1 head per color).

As for previous models (without roll-to-roll capability), at FESPA '09 I was told by the distributor for Holland and Belgium that the price is €59,000. At FESPA Munich 2010, the distributor based in Polland said the price was €49,000 for the model that comes with 4 colors + white. The price in US$ is $65,000 (again, without roll-to-roll capability), but prices may vary according to your location and distributor.

The following aspects are not included in Skyjet's FOB (free on board) price:

Shipping expenses:
   • Freight
   • Customs taxes at destination

Instalation expenses:
   • Engineer's round tickets
   • Hotel and meals

The price of distributors might be different than Skyjet's because in some cases all these aspects listed above are included.

Please realize that many Chinese manufacturers offer two versions of each printer: an export version and a local version. The version for sale within China has Chinese components. Thus the price is low. The export version has some components from Japanese, Korean, Taiwan, European, and North American companies. However of course nowadays many of their products are no longer made in their home country: they are made in China. But all versions of all models have the nuts and bolts, so to speak, made in China.

Skyjet booth at APPPEXPO 2010 in Shanghai. The FlatMaster+Roll is the model in the foreground. At the back, you see the Skyjet FlatMaster UV.

When you are at a trade show the price quoted will of course be the local version. But if you live outside China, it is not easy to get Chinese components to replace parts that break or wear out. So it is important to have the export version. Here the potential issue is how to make sure that the machine that lands in your country really has the components that are for the export version. So be sure that your invoice clearly and specifically mentions what is inside your machine.

These comments are based on several years experience inspecting printers of many different brands around the world.

Skyjet Flat-bed UV at FESPA Amsterdam 2009. This printer would be renamed later as the FlatMaster UV printer.

MAN Print & Sign is one of the European distributors.

Purchasing

8. Who are the distributors for this printer in the USA? In what other country(ies) can I find dealers?

MAN, the distributor for Sky Air-Ship in the Netherlands covers also Belgium and Luxemburg, but at the moment, MAN is only covering the Netherlands. Recently, Skyjet has sold 2 FlatMaster units in Belgium by themselves. So Planetgraf is the distributor in Poland which covers also Germany. There are also distributors in the USA, Brazil, Russia, India, Pakistan, Bangladesh, Taiwan, Ukraine, Egypt, Iran, Malaysia, Singapore, and very soon in Italy and Spain.

Skyjet's major distributors are in Poland & Germany, Indonesia, USA & Canada, India, Turkey, Russia, Spain(A-gent), and Philippines.

Then, at FESPA Munich 2010, a Skyjet printer was exhibited by Planetgraf, the distributor based in Polland. Notice that these two photos of distributors in Europe were taken before the FlatMaster+Roll's official launch at APPPEXPO Shanghai 2010, but it is expected that these companies be the distributors of this newer model.

Structure of the Printer: Media Transport Mechanism

9. Is this a dedicated flatbed with no roll-to-roll capability?
This is Sky Air-Ship's first dedicated flatbed that also includes roll-to-roll capability.

10. Was this printer made originally as a UV-curable ink printer, or is it retrofitted with UV-curing? If retrofitted, what was the original brand or model?
This flatbed printer is the fourth or fifth generation flatbed printer from Sky Air-Ship. These flatbed series are designed from the beginning to be UV-cured printer.

Flatbed Aspects

11. How is rigid media fed?
Rigid media is placed manually, as in most other flatbeds.

Other industrial (and much more expensive) printers have automatic feeding mechanisms, but these are optional features more often found in a combo printer (that moves media with a conveyor belt). A feeding mechanism is more appropriate in a combo printer because the mechanics of a combo printer is already based in the idea of moving media while printing, so the automatic feeding mechanism acts as an adaptable module that continues the movement of the board. But in a flatbed printer, media is supposed to be stationary, so a feeding mechanism would not be as practical.

12. Does the table move? Or only the gantry above it?
The table is stationary. The gantry moves in Y axis while the printhead carriage moves in the traditional X axis.

13. Can you be feeding new material at one side of the printer while the previous job is still printing out the other side?
Yes, for rigid media it is possible. You can load several pieces of material while printing. As for the roll media of course you can't load a new roll while other is being printed.

14. Is two-sided printing realistic? Is there a special mechanism for registration on the second side?
Yes. There is a function that allows printing either forwards or backwards, which allows for accurate registration. There are also location pins on the flatbed table.

The gantry moves in Y axis while printhead does it in X axis, as in most flatbed printers with an entry-level to mid-range price. The only flatbed printers on which the table moves are the industrial Inca printers, but otherwise that design is hardly ever found.

Roll-Fed

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

There is no vacuum function in the platen, so roll-fed media is held flat by tension.

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

Roll-fed media is held in a spindle.

A saddle is commonly found in 5-meter dedicated roll-to-roll printers because spindles wider than 3 meters could sag. But a spindle is the better choice for a printer such as the Skyjet FlatMaster+Roll, since the print width for roll-fed media is only 2 meters.

17. How is the roll media handled at feeding position? Dancer bar? Tension bar?

There is a dancer bar to create tension in roll-fed media.

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

The roll-fed feature comes included in the FlatMaster+Roll model, but is not available for the previous Skyjet flatbeds.

19. Describe the overall path of the media through the system?

Media goes from the feeding spindle to the dancer bar, which is in a lower position. From the dancer bar, media goes up to the roller located before the platen (the printing area). Once printed on, media is driven downwards to be collected in a roll located a few centimeters below the platen.

Roll Media Path on the Skyjet FlatMaster+Roll

Roll-to-roll mechanism is designed at the front.

Printhead carriage.

Platen

Take-up spindle

Media

Feeding spindle

Dancer bar
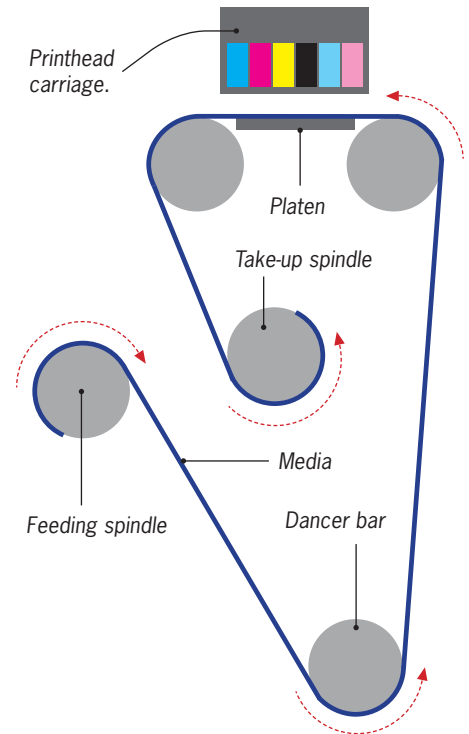
The two steel air pressure rollers generate tension by means of two sets of clutches, which are composed of
   1. Motor
   2. Controller

The tension of the roll media can be adjusted by changing the settings in the controller.

Skyjet FlatMaster+Roll at APPPEXPO Shanghai 2010.

Frontal roll-to-roll system optimizes media because only a small amount is needed to have it loaded.

The diagram above explains in detail the elements you can see in the photograph at the left.

Upgrades

20. What features have been added, or changed since the printer first appeared?
As mentioned earlier, in this newer model the width is bigger than the length. The control system has been upgraded. This model has automatic height location. Reportedly, the UV light energy can be varied in 6 levels: 40%, 50%, 60%, 70%, 85% and 100%.

Operating the Printer

21. In the main area for operation, is the machine software based (touch screen), or with physical control buttons? Or both?
Most of the operations (except loading media) are software based in the sense that you use the computer, but the monitor is not touchscreen. There are only a few physical buttons.

22. Do you get an LCD screen in the printer or other real computer monitor? How big is the screen or monitor?
It is not included in the purchase price but SkyJet can supply one.

23. Where does the computer keyboard sit?
The whole computer is not fixed to the printer, nor is there an arm to install to, so the keyboard can be moved to certain degree.

24. Is there a ledge or other space where the operator can park tools, cleaning liquids, iPod or other accessories?
No. Since the computer is independent, there is no such thing as a ledge to put tools.

25. Where does the operator stand or sit?
Again, since the computer is not fixed to the printer, it can be put in either side of the printer. However, at APPPEXPO 2010 in Shanghai, the computer was located at the right, because it is easier to connect to the printer in this side.

The computer is not fixed to the printer, so it can be placed anywhere around the printer, but apparently the best location is at the right because of the computer connection.

Construction (Build Quality)

26. What is the solid-ness of the construction of the outer body? Is it plastic? Metal? Heavy gauge?
The framework is steel. The outer parts are also solid metal.

27. Is there a hood?
The gantry is not enclosed, so there is no hood.

Set-Up of the Printer: Practical Considerations

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

Width	Breadth	Height
4.18m (13.71 ft)	2.15m (7.05 ft)	1.35m (4.43ft)

Printhead Technology

29. Which brand and model of printhead is used?
Konica Minolta 512 MH or 512 LH.

The following chart summarizes some of the differences between these two options:

30. Is the printhead identified in the spec sheet brochure by brand or also by model, or not at all?
Yes, brand and model are clearly identified. Other printer manufacturers, such as Mimaki and Oce, hide the brand name of the printheads that they use. This is silly since any resourceful or industry-knowledgeable person can figure out what printheads are being used.

	KM 512 MH	KM 512 LH
Drop Size	14pl	40pl
Grayscale	4 levels	Not available
Firing Frequency	7.6kHz	13.2kHz

31. How many total number of printheads?
It is up to you. The options range from 4 printheads up to 12.

32. How many other printers utilize the same printhead? Have they shown any problems?
i. GCC StellarJet 183UV, K72UV, K100UV,
ii. Gerber ion flatbeds
iii. Agfa Anapurna M
iv. Dilli Neo Titan
v. Grapo Manta (being replaced by the Grapo Gemini, which uses XAAR 1001)
vi. Sun Neo UV LED
vii. Sun Neo Evolution
Konica Minolta printheads have a good reputation.

33. Does the software use passes or modes to describe quality levels?
Yes the quality levels are differentiated by number of passes.

Printhead DPI & Features

34. What is the drop size in picoliters?
Either 14pl or 40pl, depending on the printhead model of your choice.

35. Is there variable droplet capability?
In the KM 512 MH model there are 4 levels for grayscale.

36. What is the nozzle spacing?
141 μm pitch x 2 lines of nozzles.

37. 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?
Advertised DPI is 1440 but there is no official notice of whether this is apparent or true.

Konica Minolta heads are used in some respected printer brands, most commonly in the mid-range price level. Entry-level price printers tend to use XAAR, and high-end price printers tend to use Dimatix Spectra heads. The only high end printers that use a different brand other than Spectra are the EFI VUTEk printers.

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

Yes the quality levels are differentiated by number of passes. There are three print modes:

Media Type		Flatbed		Roll-to-Roll	
Number of Heads		4, 5, 6, 7	8, 12	4, 6	8, 12
Print Mode	Draft	16 m2/h	25 m2/h	15 m2/h	23 m2/h
	Production	11 m2/h	18 m2/h	10 m2/h	16 m2/h
	High Precision	8 m2/h	14 m2/h	7 m2/h	12 m2/h

Printhead Positioning

39. What is the position of the printheads relative to the media? Above, jetting down or alongside, jetting horizontally?

Above jetting down.

At the moment there is no flatbed printer that has the printheads installed in a different position. In fact, he only wide-format printer I have seen that has printheads in a horizontal position is the HP Scitex XL1500. The SKYJET Premium Synchro Double Side Printer has the printhead carriages (it has two) slanted about 40°.

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

They are 90 degrees relative to the media.

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

The Konica Minolta 512 cover a path of 3.6 cm, irrespective of whether they are 512 NH or 512 LH.

Substrates

42. What sizes of material can be printed on?

Maximum printing width for rigid materials is 2.5m (8.2 feet). For roll media, maximum print width is 2.05m (6.72 feet).

43. What thickness can this printer handle?

For the export version, max thickness is 10cm. For the local market version, max thickness is 5 cm (1.96").

44. What materials does the manufacturer list?

The materials listed by Sky Air-Ship are:

Rigid media:
- Glass
- Ceramic tile
- Aluminum
- Wood
- Plexiglas
- Acrylic
- KD board
- Foam board
- Corrugated paper

Flexible materials:
- Wallpaper
- Glistening film
- Canvas
- Carpet
- Leather
- Paper
- PVC, etc.

Realize that some rigid materials require priming or pre-treatment.

At APPPEXPO 2010, both printing modes were being shown: rigid and roll capability. It is important for a printer to be printing as much as possible during a trade show. Machines that are not running have the risk to be perceived as unfinished prototypes.

Market Intended for this Printer

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

This printer has been designed for signage mainly.

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

The previous model, the Flat-bed has been sold to companies in the glass industry, advertising industry, and many others.

Applications

47. What are the applications listed by the manufacturer?

The print samples in the brochure make emphasis in interior decoration applications, such as cabinet doors, ceilings and wallpaper.

Ink

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

Our notes from the full evaluation on the Skyjet FlatMaster issued last year read "Since a roll-to-roll system is being planned for the near future, SkyJet is working with some ink manufacturers for an appropriate ink for flexible material". The ink manufacturers continue to be the same, so we can infer a special ink formulation for flexible materials has been prepared for the FlatMaster+Roll.

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

CMYK, lc, lm + White. Varnish is also available for rigid materials.

50. What company makes the inks?

There are two options: Toyo or Sun Chemical.

If you analyze the other printers using Konica Minolta heads, you will notice Toyo tends to be used in those machines. There are exceptions but most do use Toyo. The ink that is offered by any manufacturer is based primarily on the relationship between printhead manufacturer and their favored ink company, or other factors related to industry relationships (or price). Manufacturers often have a long-term relationship with one ink company: so Oce and Inca use Sericol ink no matter what.

Ink Cost

51. Does the refill container of ink come in cartridge, bottles or bulk?

Ink comes in bottles.

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

The price of 1 liter bottle for dealers is US$95 delivered from Skyjet China. It is cheaper if bought from Hong Kong.

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

1 to 1.2 ml per square feet, which is equivalent to 10.7 ml per square meter.

54. What is the cost, in ink, per square unit?

10 cents of dollar per square feet.

UV Curing Lamps

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

Mercury arc.

56. How many watts are the lamps?

The watts can be varied in 8 levels to handle materials with different resistance to UV light heat.

57. What brand of lamp is used?

Integration Technology.

One of the aspects to meet international standards—and therefore, international acceptance—is to shield UV light properly.

RIP Software

58. Which RIPs are featured? Does the price of the printer include a RIP?
Caldera or Photoprint.

Caldera is commonly used in the most known printer brands in the industry, such as Durst, Canon, Oce, Agfa (in their :Anapurna family), WP Digital (now called Polytype Virtu), Grapo, HP, Mimaki, Epson, DGI, and several others.

Caldera is a renown RIP brand in the industry. Photoprint is a more affordable RIP mainly used in Chinese printers.

General Considerations

59. How many printers of this model are in use; in the USA; in the rest of the world?
This model was launched a few months ago. Sales will start the following months.

Conclusions

Pros
The Skyjet flatbeds have had years of developing and improvements. Being the fifth generation, the Skyjet FlatMaster+Roll gathers considerable amounts of engineering experience.

The components used in this printer come from recognized and respected brands in the industry: Konica Minolta, Caldera, Toyo, Sun Chemical, Integration Technology, Igus. As mentioned in other reports, Good components by themselves don't automatically make a good printer. It also takes a good engineering team with experience and an overall corporate business style open to learning from the real needs of sign shops.

The idea of different strength levels of UV light for different materials is innovative. We look forward to hearing from end users how this works.

Although Sky Air-Ship is 100% Chinese company, all literature we have had to make the Skyjet reports is perfectly translated to English.

Cons
It would be advisable for Skyjet to include the computer in the base price since most competitors include it. Since Caldera RIP works mostly with Linux it would be easier for operators to receive a computer from the manufacturer instead of leaving them with the task of finding which equipment would be the most appropriate to run the RIP.

UV light still needs to be properly shielded. The recent models from other manufacturers have been modified so that UV lamps are totally enclosed.

The Next Steps in Evaluation
The comments on this new flatbed UV-cured printer are based on notes by Jose Melgar during the four days of Shanghai sign expo in July 2010. The next step is to inspect the printer in the factory. This will be accomplished by Nicholas Hellmuth during September. The following phase is to inspect the printer out in the real world with an end-user (inspect the printer at work in a printshop).

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FLAAR Reports — **TRENDs Part II:** Commentary on Marketing Reality — **FESPA 2010**

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