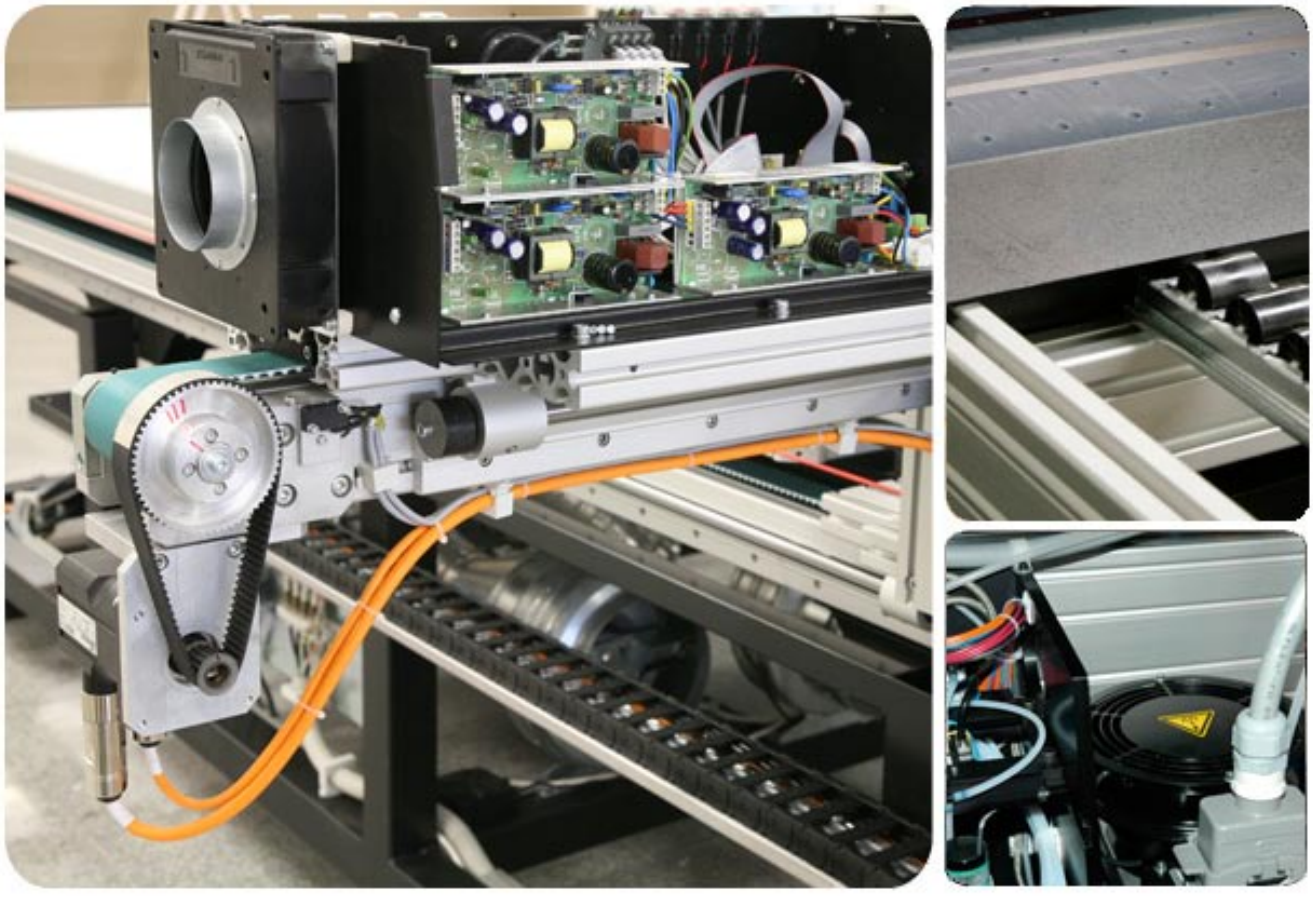
FLAAR Reports

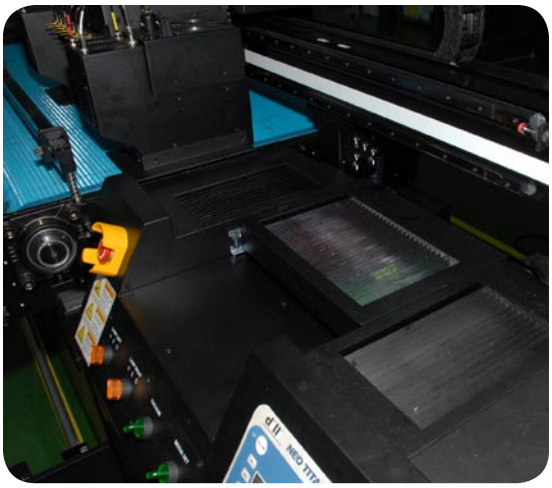
May 2009

Learning Terms & Jargon on UV-Flatbed Printers



Nicholas Hellmuth

FLAAR Reports



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Introduction

Our readers occasionally write and ask if we could provide glossaries so they could better understand the new technology. Glossaries are the type of publication one would expect from a university professor. As a result, FLAAR now offers, or has in progress, comprehensive glossaries on:

- Inkjet printing in general
- Giclée printing (fine art and photos on both canvas and watercolor paper)
- RIPs for wide format inkjet printers
- Media (paper and materials for inkjet printers)
- Lamination
- Color management related to inkjet printing
- Digital photography as input to inkjet and related digital printers

About the only subject we do not have a glossary for is electrostatic printers, since that technology is dying out. Most of the people who already own such printers already know the terms related to their industry.

A UV-curable inkjet printer costs between $80,000[1] and $500,000. This glossary was created to help people understand the jargon in the advertising and printer specs. We hope it helps you learn the meaning of both the terms and the technology of UV-curable ink printers.

This glossary could be considered a Part II of "Anatomy of a UV-Curable Ink Printer" because a glossary is essential in order to understand the jargon used to describe a UV-curable ink printer. The other report in this trilogy is the FAQs: "How to Buy a UV-Cured Inkjet Flatbed Printer, FAQs: Questions to Ask Before you Decide Which Brand of UV Curable Flatbed Printer to Purchase.

Glossary of terms related to UV-curable inkjet printers

100% UV ink means there is supposedly 0% VOCs (Volatile Organic Components), especially during the curing process. Described in excellent detail by McKenzie, 2002, in www.alliedphotochemical.com/whitepapers/Economies.pdf.

3M Scotchprint Graphics, a division of the same company that produces sticky note pads and Scotch tape. For about a year (circa 2002) Scotchprint Graphics rebranded a UV printer from L&P as the 3M model 2500UV. This was a sophisticated and costly UV curable printing machine. However that early 3M ink reportedly had issues and since 3M is not experienced in selling printers, the partnership dissolved. But in 2006 3M began selling a new version of the venerable Durst Rho 160 (one of the earliest UV printers made, back in 2000) as the Durst Rho 160R. Although, I have not yet seen this printer at any 3M booth at any trade show that I have attended anywhere in the world, I did see the Rho 160R at it's factory in Brixen. 3M is now providing LED-curable ink to Mimaki. Most ink, however, is not always fully cured by UV lamps if they are LED. But the situation gets better every year.

[1]Printers listed at prices lower than $80,000 either do not yet fully function, or during the first year cost more than their claimed price. Their claimed price is only FOB. You have to add delivery cost, training cost, ink, warranty (after the initial 90-day warranty expires), printhead replacements, and other hidden costs. Because the pricing is unclear, we have initiated a special publication dedicated to helping people understand how the price on the invoice is going to be higher than the price quoted in the trade show booth. This is primarily a problem on printers with unrealistically low quoted prices. With half-million dollar printers, these tend to come with everything included up front, already in the quoted price.

A

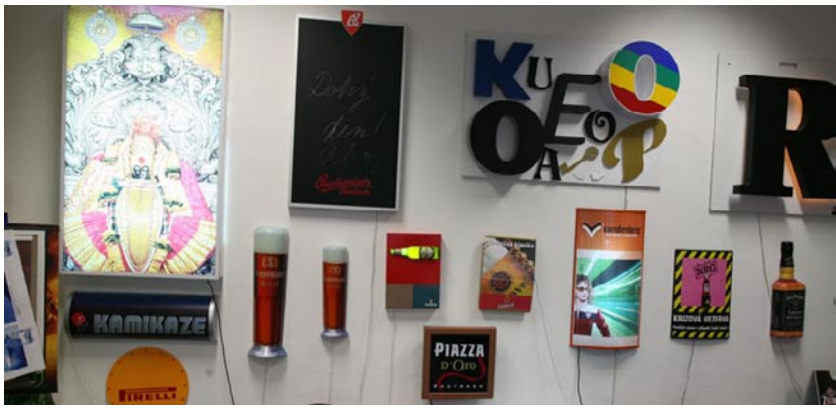
Abrasion resistance. Gerber ion^{x} sample. ISA 08

abrasion resistance, although in theory you "can print on anything," some UV-ink on several kinds of surfaces has trouble resisting abrasion to the surface of the printed material. Abrasion can come from being stacked, from being moved, from being cleaned. Scratches are a form of abrasion. If you handle the print with long fingernails, it may or may not result in a visible scratch across the surface. Also known as rub resistance or scratch resistance. See also **chemical resistance** (solvent resistance).

This is an example of how the ink begins to flake off, when adhesion is bad.

adhesion, refers to the length of time ink is able to adhere to the material it is printed on. When adhesion is bad, the ink begins to flake off. Certain inks and certain materials have more adhesion issues than other inks on other materials. To improve adhesion on many materials you may need to use a **primer**.

alpha stage, the early development stage of a printer. It is not usually wise for a manufacture to show such an early stage at a public trade show. PIT made this mistake at FESPA 2005. It is equally suicidal to advertise your printer when it is in alpha stage. Kodak learned this lesson with their ill-fated 5260 water-based printer. Agfa learned the price of pre-mature public showing with their original: Anapurna (before they switched to an **OEM** solution). Gerber first showed their cationic ink UV printer when it was barely out of alpha stage and barely in beta stage. After alpha stage comes **beta stage**.

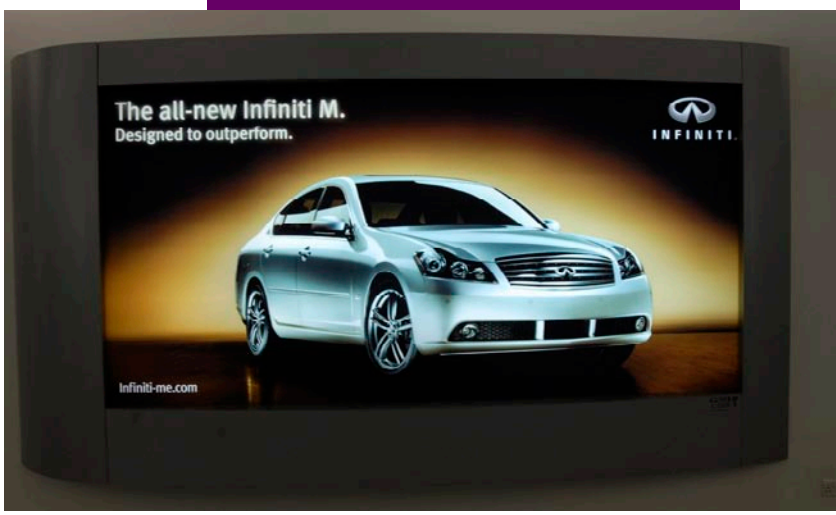


Different applications could be seen at Grapo factory visit, 2006.

applications, a use of a product: UV-curable inkjet printers can produce output for both indoor and 1-2 year outdoor usage, including architectural features (doors, panels), interior decoration (Venetian blinds, textiles), and POP advertising.

B

backlit mode; when you select this mode you get a higher ink laydown to increase color saturation when the image is illuminated from the back. This mode may or may not require extra passes or extra print time (this depends on how sophisticated the printer is and on how many printheads are available).



Backlit sample, Dubai, 2007.

banding is called many other things, such as streaking, but it's not a streak, it's a continuous horizontal defect. Banding on inkjet printer output is more complex than a different kind of banding on desktop office laser printers. Several kinds of banding may occur in wide format inkjet output. You may have the banding from the normal passage of the printhead that has nozzles out. UV ink curing causes other kinds of banding that you don't have with solvent inks. UV printers may produce rake-like raised banding, "lawnmower" pattern" caused by bi-directional printing. A third major kind of banding results from the material being fed to far (white lines result) or not fed far enough (dark lines result).

Banding is unacceptable for anything claimed to be photographic quality. However if viewed at billboard distance, no one can see the banding.

For more information on banding with water-based and solvent-based inks see FLAAR Report on Piezo vs. Thermal.

This is an example of banding.

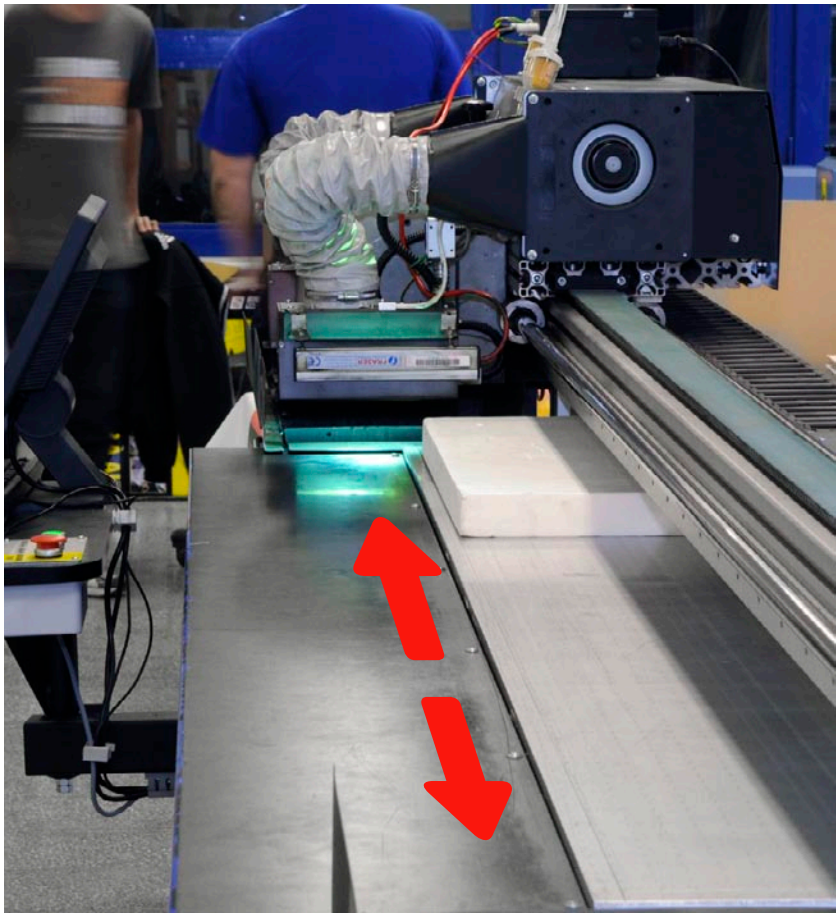
belcom The North America Group distributed printers made by Scitex Vision with Aprion printhead technology that printed on corrugated material with water-based inks. This printer became the CORjet and is now sold by HP Scitex under still a different name, FB6700 (but it's essentially the same printer). This machine is a flatbed but does not use UV curable ink or any normal ink. The ink is not identified in company literature other than that "it is made for Aprion printheads." Most industrial inks would require, by law, that the ingredients be identified in an MSDS, in case someone accidentally ingested the ink or got it in their eye.

belt, see **transport belt**.

beta stage is a printer that is not entirely finished. It functions, but still has a way to go. Mimaki tends to show their UV printers while still in beta stage. Some manufacturers make the mistake of releasing their printers while still in beta: the Zund 250, the DuPont UV printers, and virtually all Chinese printers are in this dilemma. End-users become guinea pigs when they are stuck with a beta machine.

The Flora F2 514SE 17 was in beta stage at ISA 2008

bi-directional printing. During bi-directional printing, the **printhead** jets ink as it moves both to, and from its starting point. (If the printheads jet only while traveling in one direction, it is called uni-directional printing.) Bi-directional printing is faster than uni-directional printing; however, bi-directional printing may produce lower quality results. When using UV ink, the appearance of the image may vary depending on whether printed uni-directionally or bi-directionally due to the angle the ink drops hit the substrate and the sequence of colors. The sequence of colors is one sequence going from left to right; and the laydown sequence of colors is the opposite when printing from right to left. So the resulting mixtures of color that result are ever so slightly different. A few printers have software and enough extra printheads or ink lines that makes the ink laydown sequence the same in both directions.



Grapo Manta UV printer. If you print on bi-directional mode, the print speed increases, but the quality decreases. Whereas if you print in uni-directional, the quality increases, although the speed decreases.

binary printhead technology is contrasted with grayscale piezo technology, which is championed by Xaar. Xaar grayscale attempts to achieve speed with a single pass. Binary systems achieve quality by making multiple passes (Deckers, Barco Graphics, p. 4). Since 2005 Toshiba Tec and other printhead manufacturers have licensed Xaar's concepts and made good heads. This kind of grayscale head offers variable sized droplets which helps make lighter colors appear less grainy. However, Xaar itself has not been able to produce heads that offer the quality that they talk so much about.

bleed is defined in the user's manual for the Zund UVjet 250 as releasing the negative pressure so that ink oozes out of the printhead lightly. This is contrasted with **purging** the ink, which means forcing ink out in jets.

C

capping the heads means lowering the heads (or raising the caps) to form a relatively air-tight enclosure around the head. This may be for preserving the heads and inks during the time the printer is off, or you may also cap the heads so you can suck ink and impurities out of them.

capstan, see also dancer bar, gimble, feed roller, take-up roller.

carriage is what holds the printheads; the carriage rides along a rail that is held in support by the gantry.

cationic curing (polymerization) of UV-curable ink tends is not often the process used in flatbed inkjet printers. The currently more common alternative curing technology is known as **free radical**. Free radical photoinitiation cures the ink immediately; cationic process may cure the ink over a longer period of time. Zund tried to use an early form of cationic[2] ink from Sericol in the Zund 250. This ink did not function acceptably and along with issues with the transport system, this expensive Zund printer was withdrawn (and did not reappear until autumn 2006). Beginning in late 2005, Durst offered a slightly different cationic ink in its Rho 350R. So far this printer has been in beta testing so the reliability of the cationic ink is not yet known. Digital Graphics magazine, summer issues 2006, has two excellent articles that describe cationic ink and how it differs from free radical UV-curing ink chemistry.

chassis is the printer, including the external sheet metal and internal frame, as opposed to its inks, curing system, printheads or software. See also **print engine**.

chemical resistance, refers to whether or not the printed surface (especially the ink) will hold up to chemicals, especially cleaning chemicals (solvents). See also **abrasion resistance** and **adhesion**.

Dilli Neo Titan capping station. Heads are covered by lowering the printhead carriage. Dilli factory visit, 2008.

Dr. Hellmuth examines the sturdy chassis of the HP Scitex XP 5300 (formerly known as the NUR Expedio 5000). NUR factory visit, 2007.

[2] Baldwin 2004:8, author's comments during his presentation at IMI UV conference.

collets, the parts at the end of the spool that help hold the roll of material onto the spool. See also **spindle**.

combo is the FLAAR classification designation for printers (usually UV-curable ink chemistry), that use a transport belt to move the materials instead of a platen with pinch roller working against a grit roller. A combo system works better on moving thick rigid materials. A pinch roller grit roller system may work best for moving roll-fed materials. The traditional platen with roller system is called a hybrid design. Hybrid printers tend to be cheaper than combo designs.

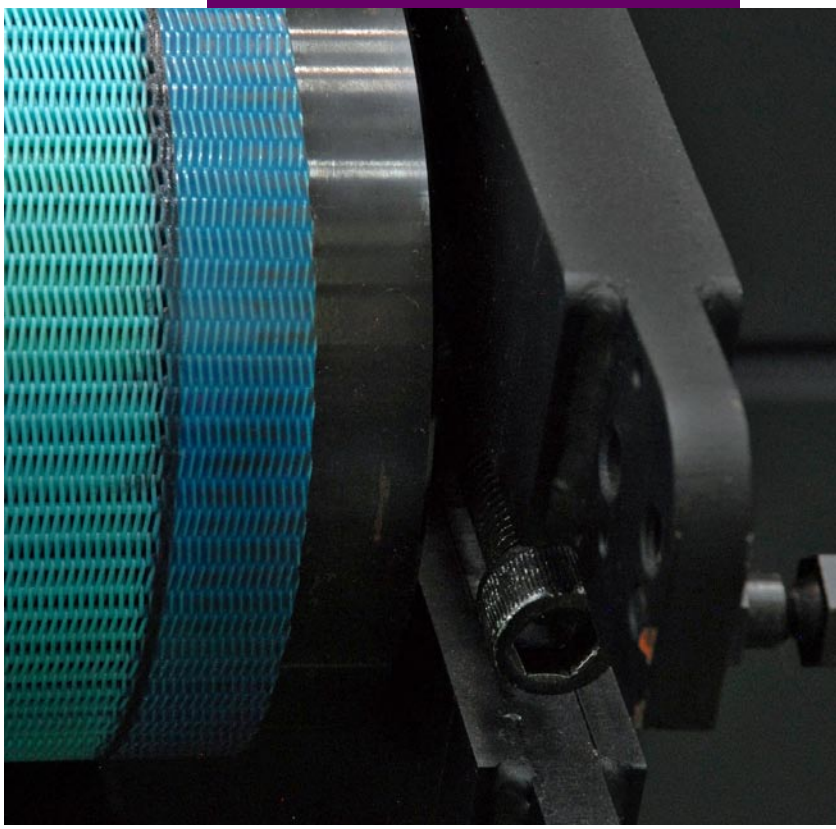
Although most writers use the word hybrid correctly to describe retrofitted solvent ink printers, they do not differentiate these retrofitted solvent printers from UV printers that are designed from scratch with a transport belt, that is not derived from solvent printers. In other words, most printers with transport belts are not distinguished by proper terms. See **hybrid** and **dedicated flatbed**.

continuous (UV) lamps, is an informal name for what are more properly called **mercury arc** lamps.

conveyor belt, see **transport belt**.

corona treatment is a pre-treatment that aids the surface tension of polypropylene and other plastics in accepting the UV cured ink, meaning it increases ink adhesion to the surface. The claims touted in advertisements for UV-curable ink printers may not admit the degree to which some materials may have to be pre-treated with **primers**, corona treatment, or **flame treatment**. An owner of a Vutek 200/600 said that Vutek actively suggested that he obtain an ionizing air gun (SIMCO G165 for a Cobra ionizing air gun). He hangs this at one end of his printer. However the effects of corona treatment gradually diminish with time, so you need to use corona-treated material before the effect wears off.

Dilli Venus is an example of a combo printer.



The tension of the transport belt of the Dilli Neo Titan can be adjusted by rotating a bolt.

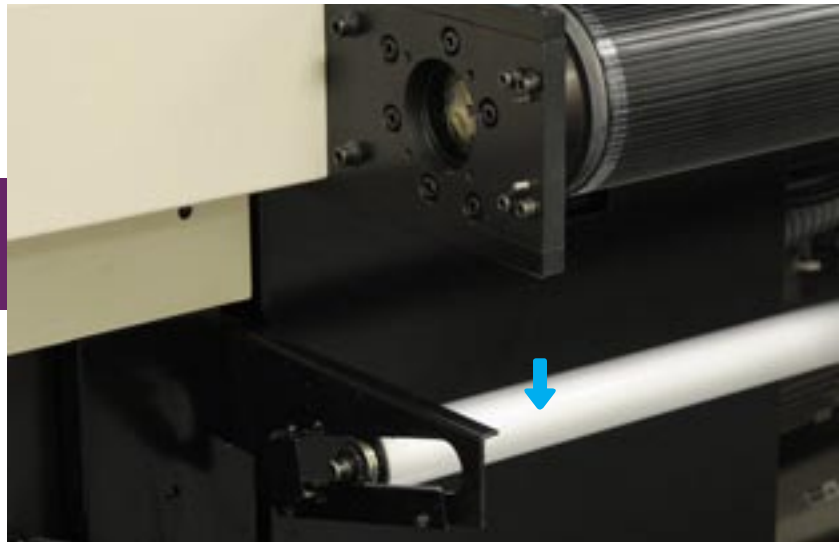
Coroplast is a trademarked brand name for corrugated plastic. This is a popular material for printing real-estate signs, political candidate ads that are stuck on lawns, and countless other signs. However Coroplast was never originally made to run under the heat of UV curing lamps nor was it made to hold UV-cured ink. Some UV-curing inks work acceptably on Coroplast; others don't. Adhesion and abrasion also depend on which brand of this material is selected, and how clean it is. Many different brands are available, such as Corex. Printer operators say that some brands are noticeably better, or worse, than others (relative to adhesion).

Coroplast.

curable, literally means to cure, in this case, using UV radiation (heat) to cure the ink. Curing attempts to permanently affix the ink to the substrate it is printed on. Two types of curing technology are available: **free radical** and **cationic**.

D

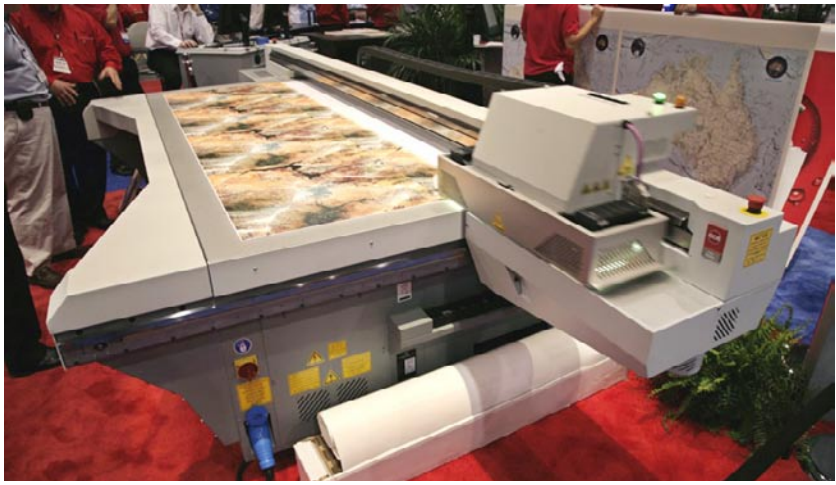
dancer bar is not for lap dancing or dancing up on the bar, but is a long rod (tube) that can move (hence the term dancer); can move freely to help moderate tension in feeding roll-fed media to the printer and in theory on take-up position as well. See also: feed roller, take-up roller, capstan, gimble.



The tension bar helps adjusting tension of roll-fed media. Raster Printers H700UV. Factory visit, 2008.

data cable(s) bring information to the printhead electronics.

dedicated flatbed is a printer intended primarily or exclusively for printing on flat or rigid materials. Some dedicated flatbeds attempt to allow you also to print on roll-fed materials, but roll-feed on dedicated printers varies from simple (the new Mimaki JF-1631) to very complex but not very successful (NUR Tempo). The Oce Arizona 250GT is too new to have feedback on how well it's roll-feeding system works. Otherwise, all these printers are dedicated flatbeds. The Inca, Gandinnovations, GRAPO Manta do not make the attempt to jerry-rig their flatbeds with roll-fed capability.



The Océ Arizona 250GT is a dedicated UV flatbed printer.

dedicated roll-to-roll: NUR made the first for UV: their Expedio. Then Durst came out with their Durst Rho 350R in late 2005. Then Gandinnovations came out with their roll-to-roll. So far only NUR has attempted to feed flat materials through their otherwise dedicated roll-to-roll. See also **hybrid** and **combo**.

degassing, in non-technical terms means removing air from the ink. If air gets into a piezo printhead, the piezo mechanism does not push out the ink in an acceptable manner. Not all printer models offer degassing, so be sure to check whether the printer you are about to buy offers this feature. With no degassing a long print run could be difficult, or impossible, without purging or a maintenance routine for your heads). An example of a high efficient system with on-board degassing is WP Digital Virtu RS25 and RS35.

Gandinnovations Jeti 5024 UV dedicated Roll-to-Roll.

dichroic reflectors, dichroic glass reflects some wavelengths and allows other wavelengths to be transmitted. One good description is www.inspirationfarm.com/GG/articles/article9.html. So if this kind of material can allow the proper UV wavelengths to work on curing the ink while minimizing the heat, they keep the materials a bit cooler. Heat from conventional UV curing lamps causes many signage materials to warp, stretch, and otherwise distort (or simply melt).

digital screen press. Inkjet printer manufacturer companies would like owners of screen printer companies to consider an industrial inkjet printer to be a digital equivalent of a screen press. Hence, many companies, such as Gretag with their Arizona, occasionally add the designation of “digital screen press” to their printers. Because there are about 30,000 screen-printing companies in the US alone, all inkjet companies would like to sell to this market. Since many screen-printing companies print onto rigid materials, for short run quantities, a wide format inkjet printer offers potential.

digital screen printing, see also **digital screen press.**

doped lamps (doped UV lamps); by including specific metallic chemistry the lamp can be made to work at the desired wavelengths for the needed effect. If you need to know more about doped effects, consult publications by RadTech.org and other resources. Iron and gallium are often mentioned in the multitude of PDFs and web pages that discuss doping.

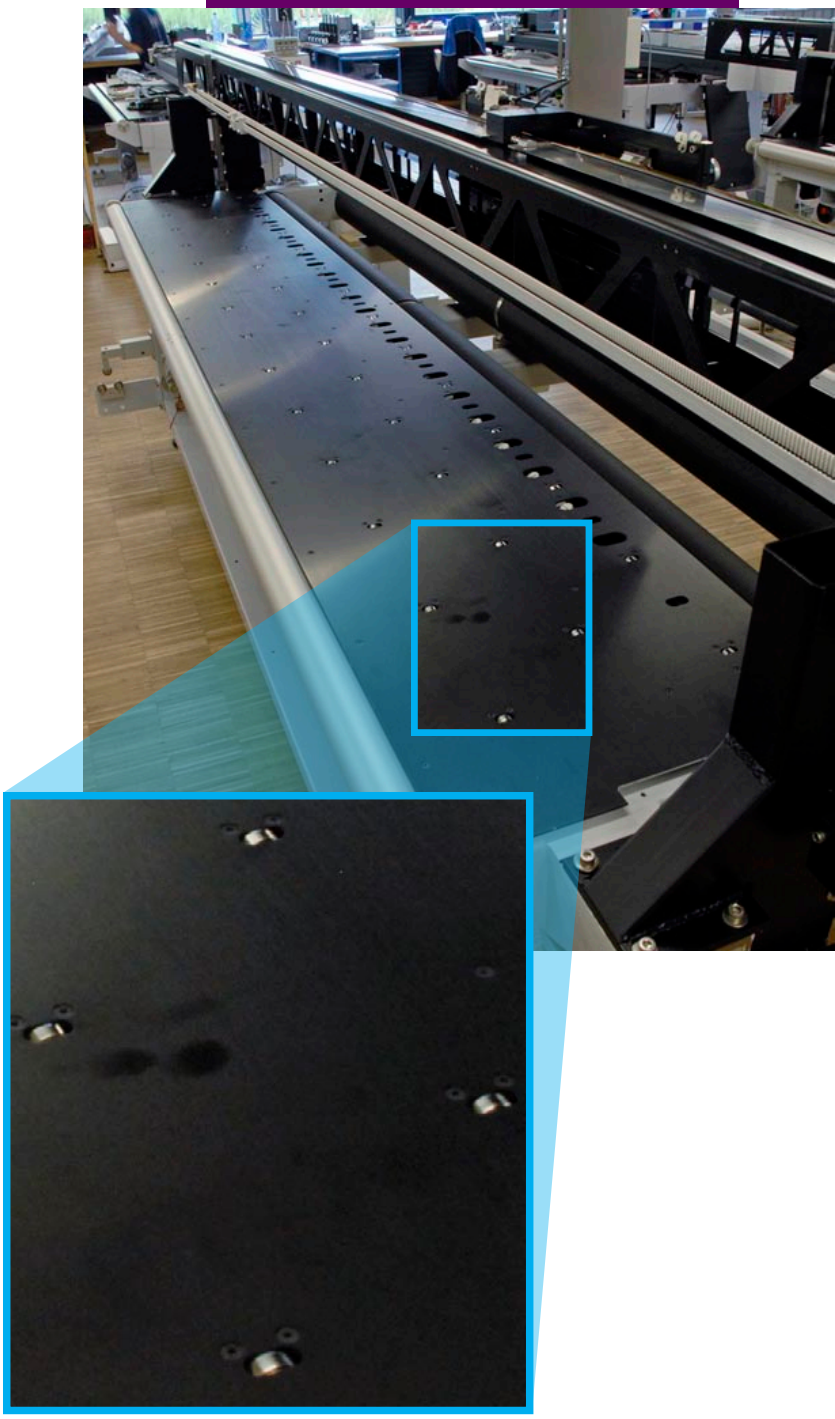
Some sign shops that are buying UV inkjet printers come from a digital screen press background.

dot gain, an undesirable spreading of the ink, covering a larger area than intended. Since the ink drops dry ("freeze") in UV-curable ink systems, there is not much time for dot gain, especially since the ink stays on the surface of the material. The ink does not penetrate the material. In any event, since most material being printed upon with UV-curable ink is not paper, the ink would not tend to spread along paper fibers anyway. Dot gain is more of a problem with normal inkjet or traditional offset printing.

draft mode, usually translated as junk mode. In draft mode, a printer prints very quickly, but with low-quality results. It is unlikely your clients would accept anything printed in draft mode. When you read the machine specs, purge any hope of productivity at draft mode from your brain. Besides, imagine the expense of doing proofs on thick or rigid material even in draft mode?.

driven, compared with "non-driven".

drive roller is a **grit roller** with no grit. If you need to print on glass, a grit roller is not benefifial. Drive rollers, since they deliberately have no grit on their surface, tend to be of wider diameter so there is more of their surface in contact with the underside of the substrate. A drive roller is always on the bottom, approximately flush with the surface of the platen. A drive roller always works in unison with a **pinch roller** (pressure roller) that is on top of it. The best place to see a drive roller is on the Zund 250. It has a double set. Drive rollers are gradually replacing pinch rollers on newer hybrid UV printers that I am seeing in 2007, so seemingly printer designers are noticing that there is an advantage to a grit-less surface when handling the diverse range of materials that you need to feed thorugh a UV printer. Grit rollers were made for solvent ink and water-based ink machines which had standard signage materials that required grit to move them. Indeed the underside of these substrates and media had their surface designed to interact with a grit roller. But rigid signage materials need to be low cost, so it's not realistic to reformulate their lower surfaces to interact with the grit of a grit roller (besides, you may need to print on that back surface, so you don't want it's surface different than the top surface).

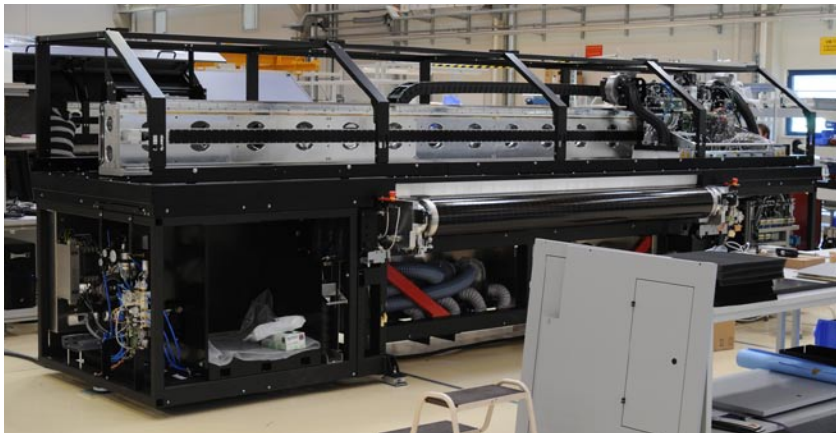


Drive rollers of the Zund 250 UV combi printer.

The pinch roller pushes the substrate down onto the drive or grit roller; this system is what moves materials through the printing system (unless you have a **transport belt**). Most transport conveyor belts have no drive rollers, in part because there is no place to situate them, and really because the transport belt is a giant drive roller.

driven roller is any roller that has a drive motor to turn it and control the rate of rotation. A driven roller is not necessarily under the media to replace a grit roller there.

Durst is an Italian company but at least one model of the Durst Rho is manufactured in nearby Lienz, Austria. See also **Rho**. The company in the US used to be named Dice-Durst: Dice makes the Cheetah RIP used to run the Durst printers. Dice and Durst split from each other during late 2003. Each is now a separate company. Durst now accepts other RIP software to run their printers, in addition to Cheetah.



Durst company manufacture section

Durst Rho 320 R at VisCom Italy '08.

E

EB is the abbreviation for electron beam, often used in the same discussion as **UV**; often stated as "UV/EB".

edge to edge, means borderless; printing up to the border so you don't have to trim off any white space. The Sericol Inca Columbia evidently offers edge to edge capability.

EH&S, Environmental, Health, and Safety, all concerns of every savvy individual.

engine, see **printer engine** and **chassis.**

The efi Rastek H700 UV is one of the printers with borderless capabilities. VisCom Italy, 07

F

feed roller, see also dancer bar, take-up roller, capstan, gimble.

fence, see **gate.**

firing frequency in kHz affects many aspects of the ink droplets. For most printers the manufacturers prefer that the user not attempt to change the firing frequency. The best place to learn technical details of this nature is to attend an IMI conference (www.imiconf.com).

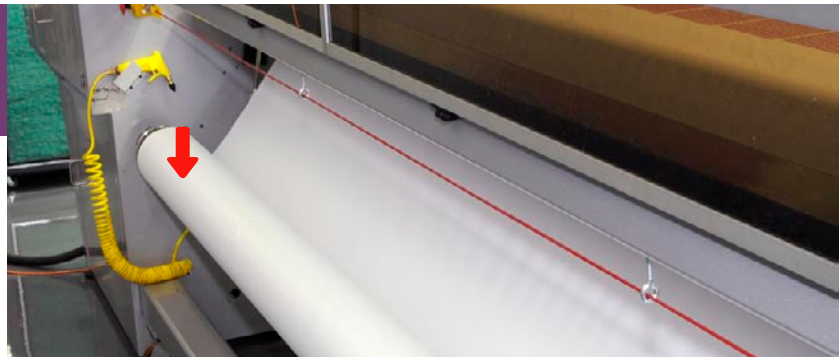
firmware is the software that gives capabilities to the printer. Firmware is made by or at least designated by, the printer manufacturer. Firmware has glitches and issues when it first comes out, so you need to get a hold of all the firmware updates over time. You also need RIP software to run your printer. RIP software is rarely made by the printer manufacturer.

flame treatment means literally to pass a flame over the surface of a plastic such as polyolefin so an ink will adhere better to the oxidized surface material. You can treat the surface of a plastic chemically, with a flame, or electronically (**corona treatment**) (www.all-pak.com/plasticgloss.asp?navid=42).

flatbed, to one degree or another most UV-curable inkjet printers are flatbeds. Some are dedicated flatbeds, which means they do not accept roll-fed materials. The only dedicated flatbed that also includes a roll-fed mechanism is the NUR Tempo. Separate FLAAR Reports list all dedicated flatbeds, all combo, all hybrids, and all dedicated roll-to-roll UV-curable inkjet printers.

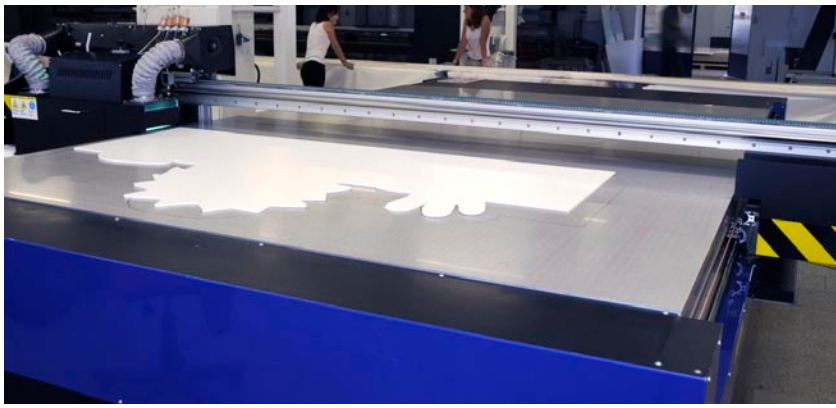
flexible substrate means something less than rigid. When a flexible substrate flexes, this may pull the ink film apart, resulting in cracking or the image falling off at that point.

flush can either be a noun or a verb. As a noun flush is a solvent-like material to clean out the uncured ink. With complex UV systems, you need to drain the ink and fill the tubes with flush material if the printer will be unused for more than a day or so.



Feed roller is the roller that holds the roll of media to be printed. Some feed rollers fix the core of the roll by an air pressure system. Air is supplied by the yellow pistol you see near the roller.

Flame treatment for pieces of glass that will be printed on a UV machine.



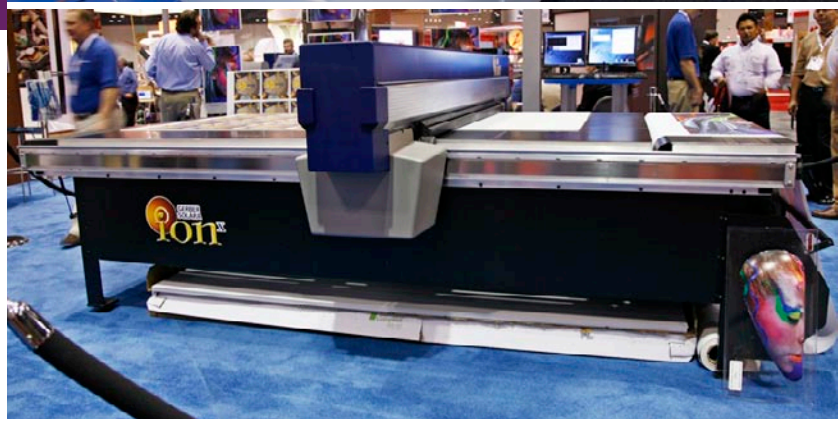
Grapo Manta is a dedicated UV flatbed printer. Grapo factory visit, 2008.

As years pass by, improvements have been made in printing flexible materials. Gerber Solar Ion^{x} print sample, ISA 08

free radical curing is generated by the photoinitiator. Results of this process include:

- Oxygen inhibition
- Free radical cured inks may shrink.

Shrinkage is not good for adhesion (Baker 1999). The alternative **cationic curing** technology has several advantages but is not yet widely employed in flatbed inkjet printer systems today.



Above, the Inca Spyder 150uv at FESPA 07. Below, the Gerber Solara ion^x at SGIA 07. As you can see, both models are desdigned with a gantry which houses the printhead carriage. The latter model uses cationic cured ink.

G

gantry is a support structure that spans a given space, in this case the structure that holds the printhead carriage and rail on which the **carriage** moves. This gantry spans the long dimension of the flatbed table. The gantry is rarely discussed.

gate or fence, is usually a drop-down bar, across the width of the printer, to help align the end of thick rigid material. The gate may or may not have accessories to help line up more than one smaller sheet of material. See also **pin registration**.

germicidal UV lamps are used to treat waste water. These lamps can operate at reasonable temperatures. It has been suggested that the Gerber ion is using a UV lamp similar to a the kind of lamp used in germicidal applications to cure its cationic ink. Gerber claims to have a patent, but so far no one has published the patent application in a place that is easy to find.

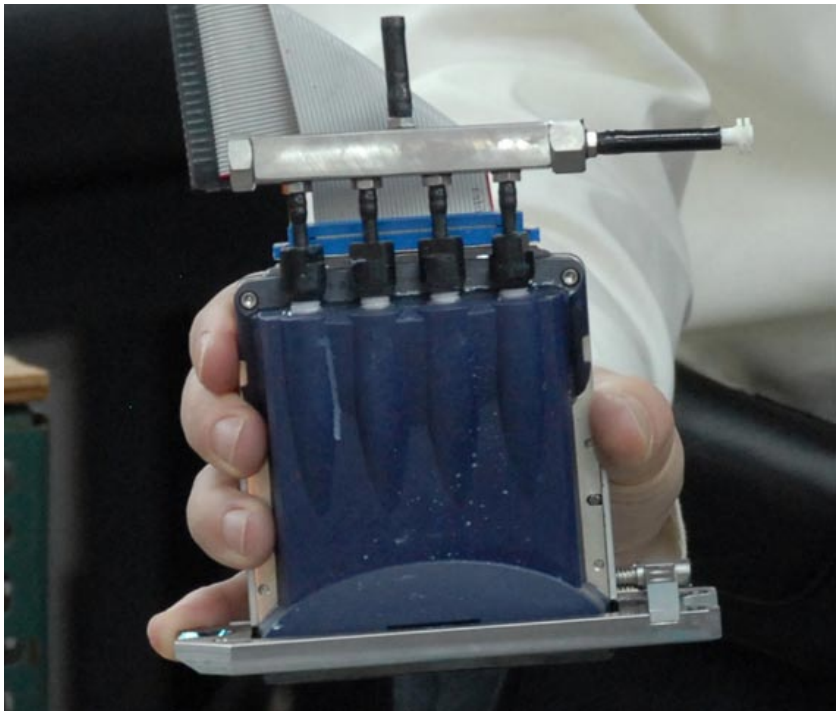
gimbal, often incorrectly spelled gimble the word gimbal comes from old nautical jargon for a part of a compass or barometer, so that a designated part will remain level (plumb) no matter what the inclination of the boat itself. So far the only time I have seen the word gimbal used in a UV printer was that of Oce, as part of it's roll-fed system, and spelled gimble. See also: dancer bar, feed roller, take-up roller, capstan.

Glossy samples printed on with the Flora F1-180uv (now efi Rastek H700uv) at ISA 07.

gloss or **glossy** means a shiny surface, sometimes almost mirror-like. Sometimes the mirror

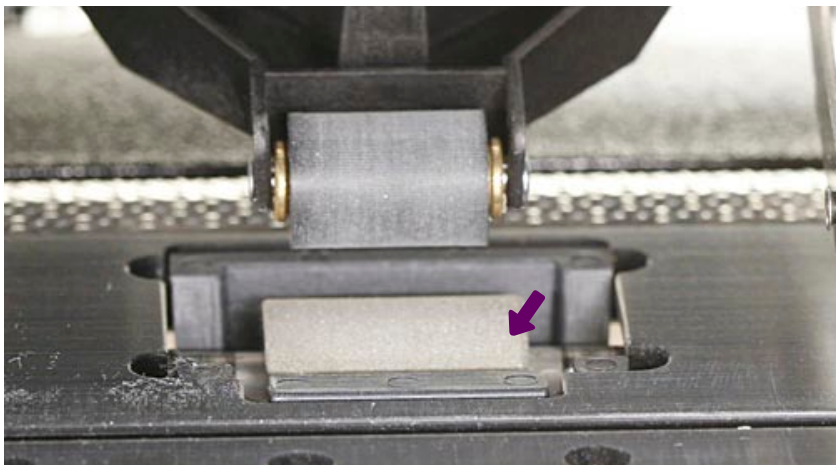
effect is undesired or unattractive aesthetically. If you are about to buy a UV-curable ink printer be sure you test to see whether (and how) you can achieve glossy, matte, and satin finish. See also **matte, satin**

grayscale printing is usually contrasted with binary printing. Grayscale offers varied drop volumes. Binary printing is using drops all of one size. I have sat through and listened to impassioned presentations on the claimed benefits of grayscale printing technology five years ago. Yet the same printheads that use this technology (Xaar), consistently produce the most banding and splotchiness. Any imagined benefits of grayscale may impress theoreticians, but what counts is whether your client asks you why the print looks so ugly. But since 2005, grayscale printheads by Toshiba Tec and others, do finally produce attractive output.



Xaar printhead used by a UV-curable printer. Xaar heads have been characterized by using grayscale technology.

grit roller is a drive roller with a sandpaper-like surface. The gritted surface uses friction to move the bottom of the media or other material. Hence inkjet media often has special chemicals to assist the grit roller to move the media at the desired speed. So uncoated materials, especially materials not originally made to be run through inkjet printers, such as glass, may not feed as predictably as specially prepared materials. The friction of the grit roller works in unison with a pressure roller. The pressure roller is usually directly above the grit roller. These rollers are found in most water-based and solvent-based inkjet printers, and in hybrid UV printers that are retrofitted from solvent printers. Most combo UV printers use a transfer belt to move the material. The Zund 215 is one of the few printers that has a semblance of a grit roller/pressure roller system in addition to a transfer belt. The Durst Rho 600 has a pinch roller over its belt, but no grit roller. See also **drive** roller (increasingly used in hybrid UV printers).



Grit roller of the ColorSpan 9840

guide bar is an informal designation for what is usually a long rectangular strip of metal, often alongside the left edge of the roller table or on the transport belt. This helps you align flat rigid materials so they don't skew as badly when they go through the printer. See also **stop-bar** (**gate** or **fence**).

Durst Rho 800 guide bar

H

HDPE is the abbreviation for high density polyethylene, a plastic from which you make bottles.

hybrid (printer) is a kind of retro-fitted printer design whereby what was once a regular **roll-to-roll** printer has a flatbed feed and flatbed take-up system added (front and back). This allows you to print roll to roll and also as a flatbed. Downside is that such a printer's feeding system was not designed from the beginning to handle thick or rigid material. A hybrid printer moves the material under the printheads by a pinch roller working against a grit roller. The grit on the grit roller uses its friction to move the underside of the material. So some smooth or slippery materials may not be properly transported with a grit roller, hence the development of a transport belt in more expensive UV-flatbed **combo** systems. See also **dedicated flatbed**.

The GCC StellarJet 183uv is a hybrid printer. You can see the table that is pulled up for flatbed applications. But it can be lowered for roll-to-roll option.

I

Inca Digital Printers, a company headquartered in the United Kingdom. Their printers include the Inca Eagle and Inca Columbia, marketed in the USA by Sericol, an ink manufacturer and distributor. Circa 2005 Sericol was bought by Fujifilm and Inca was bought by Dainippon Screen. Inca also manufactures the FastJet for Sun ink company.

inhibitor, as the word suggests, something which inhibits, in this case inhibits a further chemical reaction.

interface is a term found in most printer spec sheets, and usually is where the manufacturer lists what kind of cable connects the printer with its RIP server or with whatever other computer or network sends printshops. Most printer interfaces today are Ethernet (regular network cable), or USB2. However there are some unusual and rare kinds of interface, such as that used by ColorSpan.

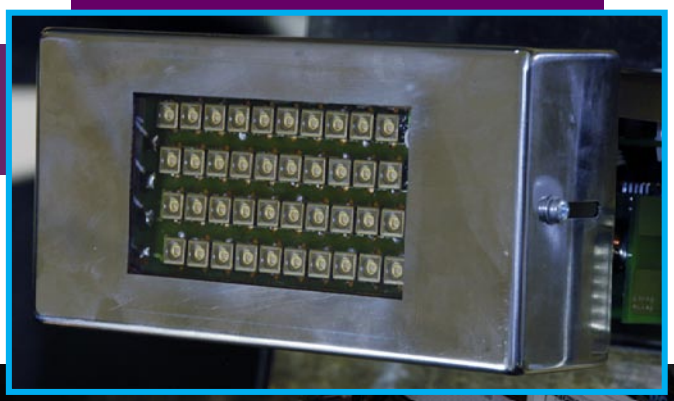
Inca Spyder 320+OV UV printer at ISA '08. Inca has a long tradition of UV-cured flatbed printers.

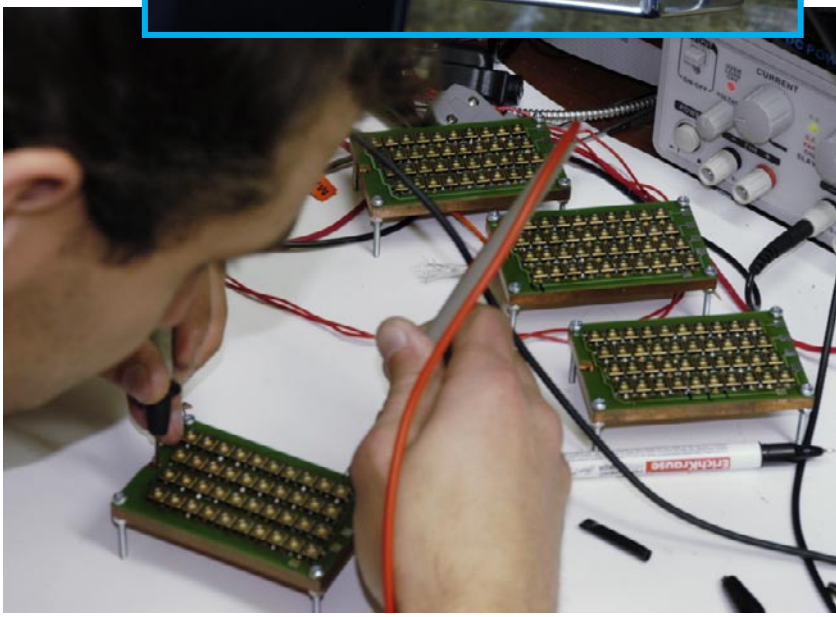
irradiance is the measure of the sum (intensity) of all radiant energy reaching a defined area.

L

LED lights are preferred for curing UV inks because LED lights are cooler than all other currently used forms of lighting. Cooler lights mean that thin or heat-sensitive materials do not bubble, curl, or otherwise deform as they pass through the printer. Deformed material can cause head strikes which can damage or even destroy the nozzle plate on an expensive printhead. But up until 2006, the only UV printer to successfully utilize LED lamps was the Inca Spyder 150 (vintage 2004). Then, in 2006, Luscher changed the pinning portion of its curing system to LED lights. Otherwise, LED lamps for UV-curing is a relatively untested technology. Almost all UV inkjet printers today use **mercury arc** UV lamps.

Lexan is a polycarbonate. Ink does not always stick well after a certain amount of time. Vutek owners in particular have reported issues with printing on Lexan during 2005.





Testing LED lights at Sun factory. 2007

M

M.A.G.I.C. = Multiple Array Graphic Inkjet Color. This is the technology named by Aprion, now part of Scitex Vision. This process does not use UV-cured ink. The specs are not forthcoming on what ink it does use. One of the few printers to use this printhead technology is the CORjet, for printing on corrugated sheets. The quality is impressive. The printer was formerly distributed by Belcom in the US. HP Scitex has taken over distribution from Scitex Vision. The entire printer weighs nine tons.

mandrel, is a machined steel support, which may be used as a core or other form of support. Mandrel is more jargon from a machine engineer's point of view; today a lay person would call this a spindle. See also **collett, spindle**.

MDO is a jargon abbreviation for medium density overlay. This is a plywood whose surface has been coated by a resin-impregnated paper, vinyl, aluminum or other smooth material on one or both sides. This outside surface accepts paint or inkjet ink. MDO is used for construction signs, so a plywood that can hold up outdoors. Standard sheet size is 4 x 8 foot sheets.

media is material that has been coated with an inkjet ink receptor coating. This kind of ink receptor coating is not necessary for UV cured inks, although you may still need special surfaces and/or a pre-treatment of surfaces. See also, **corona treatment, flame treatment** and **substrate**.

MEMS (printheads), MEMS is an acronym for MicroElectroMechanical System; see www.memsnet.org and a thousand other web pages. Spectra M Class heads are MEMS heads, and used by Raster Printers Daytona T-600UV flatbed and L&P Virtu HD8 combo UV printers. The Scitex Vision X2 printhead was also MEMS technology, but has poor manufacturing yields and high failure rate inside the HP Scitex XL2200 printer.

mercury arc, lamps for UV-curing. These are often just called “continuous” UV lamps to distinguish them from pulsed Xenon lamps which flash. Mercury arc UV-curing lamps are in 95% of the UV-curable inkjet printers today. Some of the major companies that make these kind of lamps are Integration Technology (England) or Dr Hönle (Germany). Other kinds of lamps, that are rarely used, are **pulsed Xenon** and microwave. **LED** lights are still in experimental stage for UV-curable inkjet printers, with the Inca Spyder 150 and Luscher JetPrint two of the few that use LED lights so far.

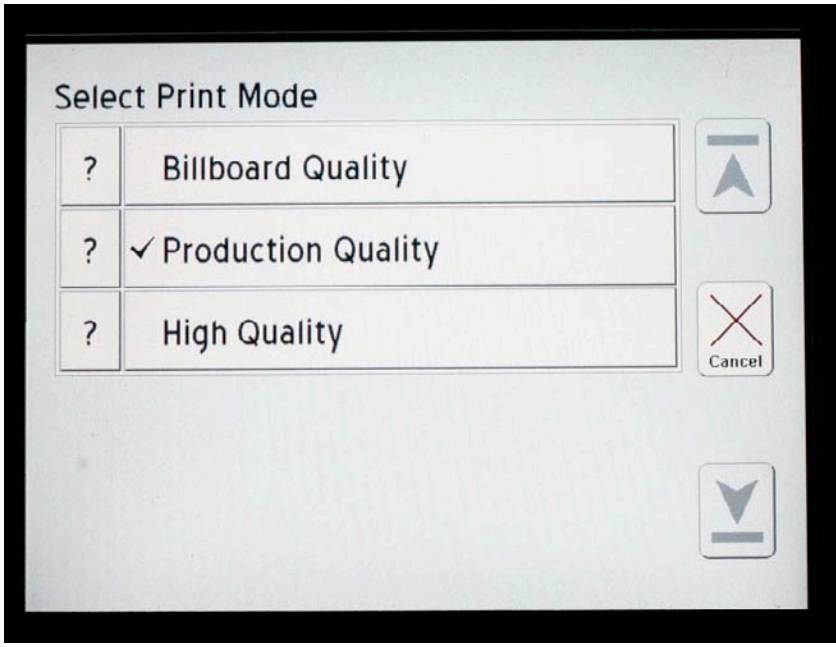
misting, inadvertent spray of the ink that floats around inside the printer and then usually escapes to float around the printing area, This is an undesired feature of some UV-curable ink systems because the ink is a health hazard. Although the printing mechanism is enclosed, if the ink forms a mist, it can easily float through the print shop because the printers are by no means hermetically sealed.

Ultraflex is one of the most popular media manufacturers. If you attend a printer trade show, you will notice a lot printers have an Ultraflex sign.

The VUTEk printers use mercury arc lamps.

Misting can ruin your print job.

mode is usually a way for the printer manufacturer to use jargon (such as Production Mode, Quality Mode) rather than uses the number of printhead passes to classify speed vs quality. Sometimes the use of the concept of mode is to help make the operator's decisions easier (to use concepts of speed and quality, rather than get arcane and pedantic by listing printhead passes), but in many cases the use of the jargon "mode" is to distract the end-user from realizing how many times the printhead has to pass over the same area to clean up the errors of the first passes which tend to provide incomplete coverage.



The HP Designjet H35000 offers three print modes.

monomers are simple chemical compounds that can join together to make new compounds (such as polymers). Monomers are ingredients used in ink formulation. Multiple monomers join together during **polymerization** to form **polymers**. The best place to find technical information on inks is from conference reports of IMI and by The Tiara Group (two separate industry conference series).

mounting means placing a printed image onto a stiff material. With an UV-curable ink printer, you do not have to mount anymore since, you can print directly on top of the board.

MSDS is a list of the ingredients of the chemicals used in any product, most importantly products with health issues. By federal law every supplier is required to make the MSDS sheet easily available. But in practice most printer manufacturers and ink companies make it difficult for anyone to obtain their MSDS since they don't want competitors to know what's really in their ink. MSDS = Material Safety Data Sheets.

N

negative pressure is needed to keep the ink from flowing or dripping out the nozzles. Each printer system handles negative pressure differently. Some printers require being "on" constantly in order to maintain negative pressure. In this case you need a battery back up system to keep the printer at least in sleep mode (or whatever mode keeps the slight negative pressure activated). Other printers can be turned off totally and only a few drops drip out (which merely land in the parking area which accommodates them).

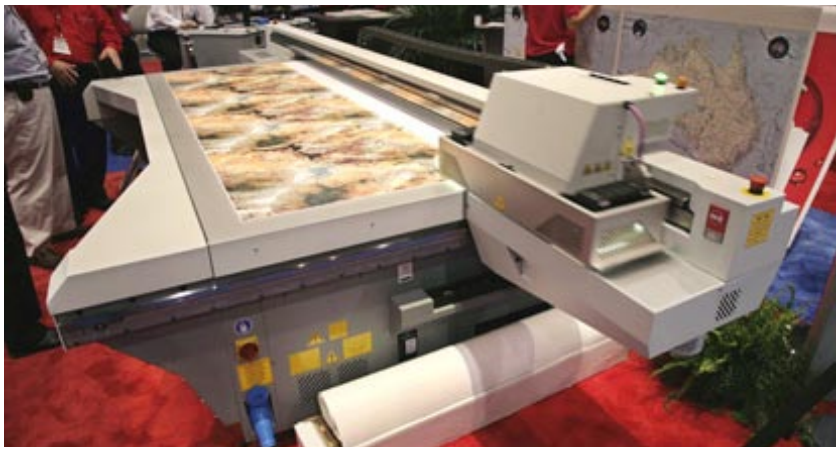
This photograph shows a printhead carriage taken from below. Since printheads are set in a vertical position, negative pressure is needed to keep the ink from dripping out of the heads.

nitrogen blanket is the gas and it helps in a UV-curing situation which assists in minimizing and counter-acting **oxygen inhibition** (Deckers, Barco, p.4). Spec sheets rarely mention what technology is inside their UV printers. However Sun specifically lists nitrogen blanket for their FastJet. The Agfa :Dotrix also uses a nitrogen blanket.

non-driven roller (or actually the spindle or shaft), compared with driven roller. A non-driven roller has no drive motor; a non-driven roller turns, or allows a core to turn on it, because something else in the system is moving.

nozzle plate is the thin strip of metal through which the holes for the jets are situated. The nozzle plate is delicate, and when the printhead hits a raised edge of the material nozzle openings can be damaged or destroyed. To protect the nozzle plate from head strikes most nozzle plates are recessed. While testing the ColorSpan 9840 UV printer the slab of concrete we were using turned out to be raised in the middle, so the estimated thickness (on the edge) was not high enough when the printhead carriage passed over the concrete. So there were repeated head strikes as the head dragged itself over the rough surface (we were elsewhere in the room and it took a while to get back to the printer and stop the carriage). I figured we had destroyed the heads, but after cleaning off the gravel, concrete chips that had chipped off, and cement dust, the heads turned out to be unscathed. However we do not recommend you test a lesser printer on a concrete slab. MEMS printheads do not have metal nozzle plates.

Nozzle plate of the Grapo Octopus UV printer. Printheads are going to be placed in the holes you see here.



Océ is the original manufacturer of the Océ Arizona 250GT (above) which is rebranded by Fujifilm as the Acuity HD2504 (below)

O

OEM, Original Equipment Manufacturer. So the OEM for the Agfa :Anapurna machine is Dilli, a sister company to D.G.I. in Korea. The word OEM can be a noun and a verb. The meaning gets confusing when you say “Agfa is OEMing the Dilli.” So don’t always count on knowing from the phrase who is really the equipment manufacturer and who is the reseller.

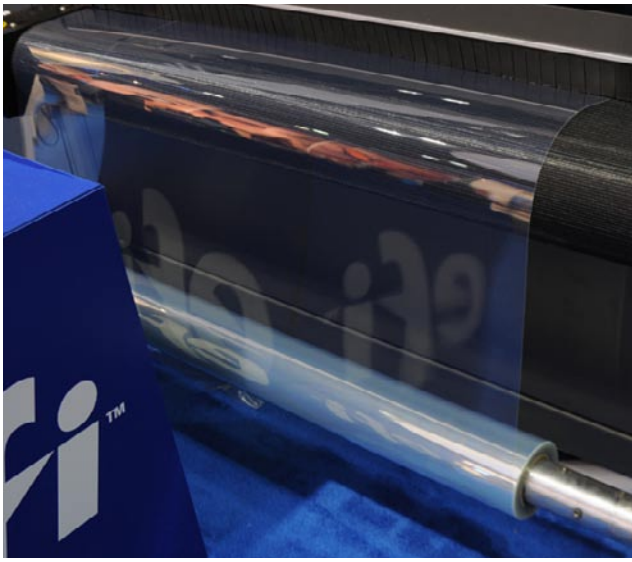
oligomers, a component in ink that provides needed properties, including adherence to some plastics (Klang and Balcerski 2002:5). Oligomers

may be formed of polyester, epoxy, or urethane: Joshua Oliver provides all the technical insight in his Sartomer publication (2002).

OPP, Oriented PolyPropylene film, a transparent film listed by Mimaki as one of the target applications along with PET (Polyethylene Terephtalate) film for using the white ink of its UJF-605R UV-curable ink printer. OPP is used in packaging of food. Further details are available in any glossary of the packaging industry or sometimes a printing glossary.

overcoat is the top coat of preservative on top of a print. However, in some rare cases, it appears to be an additional ink receptor layer on top of the undercoat. See also **undercoat.**

ozone may be an undesired byproduct of UV curing.



OPP and other transparent materials can be printed on UV-curable machines for a number of applications. However, be cautious and know your substrates in advance since the heat emited by the UV lamps can ruin your print job.

P

page array, see printhead page array.

PE, Polyethylene.

PET, Polyester (Polyethylene Terephtalate).

PET-G, Polyethylene Terephtalate Glycol. In the packaging industry this is used as shrink wrap. In the regular inkjet industry PET-G film is among the best and most expensive media.

photoinitiator is a chemical. You might consider a photoinitiator as a catalyst. A photoinitiator absorbs light "To trigger the reaction that allows monomers and resins to bond and create the cured ink film. The photoinitiators absorb UV energy at certain wavelengths, creating 'free radicals.' The Free radicals connect with the molecules of the resins and monomers and they, in turn, cross-link with each other, forming chains of molecules we recognize as the 'cured' ink film. Chemists call this cross-linking reaction polymerization."(Purcell, ScreenWeb)

pigment is the ground up mineral colorants that provide the strength of color. Nano-ink is a pigment and other ink ingredients that are ground extremely finely.

Pigment samples at NUR ink lab. NUR Macroprinters is a company that manufactured their own UV printers until it was bought by HP.

pinch roller uses pressure to hold the inkjet media down so the bottom of the media can be moved by the grit roller. The grit roller is usually directly below the pinch roller. On most printers the pinch rollers are a few inches across, though their size varies tremendously. This may also be called a pressure roller.

pin registration; pins are precisely that, metal things, about the size of a bullet, that rise up to form in a group arrangement to form a corner into which you can align a rigid board. The Gandinnovations Jeti UV flatbed has a good set of pins for registration. The Zund 250 has an innovative manner of pin placement (ever 10 cm within the pertinent area of the table). Other printers have only a wimpy number of pins, usually fixed (you want them flexible in where you can place them, not only fixed). Pin registration is especially helpful when you need to print on both sides, and need to arrange the two-sided image aligned properly.

PMS is the abbreviation for Pantone Matching System, the universal standard for spot colors in the offset printing industry.

polyester is a material that needs to be pre-treated (corona or flame) before the ink will adhere well to the surface.

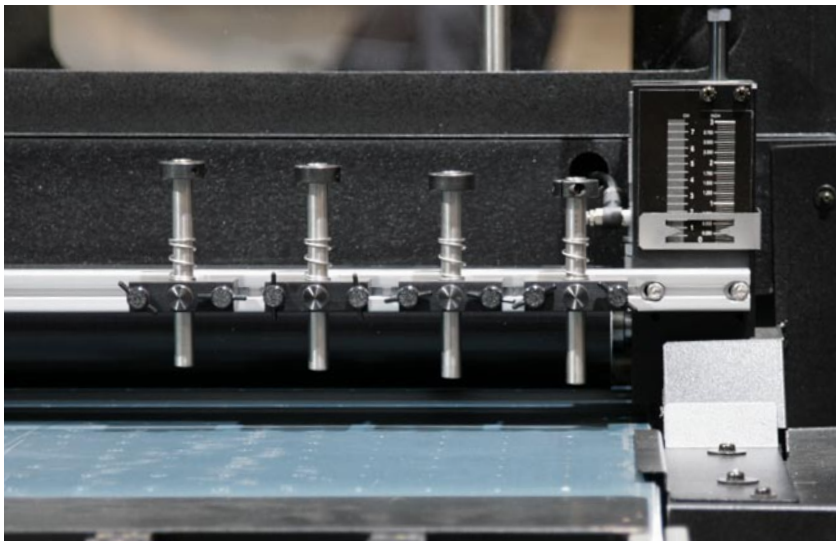
polymer is formed from lots of **monomers** during p**olymerization** (**curing**).

polymerization is the process of curing during which monomers form polymers. May be used as synonym for UV curing itself. If you need technical info, consult “Photoinitiated Polymerization,” Oxford University Press, Kevin Belfield and James Crivello, editors. Also see, “Studies of Pigmented UV Curable Systems by Real Time FTIR,” by Bo Yang, Sartomer Company.

PP, polypropylene.

pressure roller, see **pinch roller**.

An example of pinch rollers on the IP&I 1606 CUBE UV combo printer. Pinch rollers can be raised or lowered by a lever, but some complex printers move their pinch rollers electronically.



The HP Scitex FB910 UV has a pin resistration system at the front.

Polypropylene applications can be printed on with UV printers like the Dilli Neo Jupiter.

pre-treatment, usually means adding a primer which serves like an ink receptor coating. The difference is that a primer for UV is usually to help the ink adhere, not to interact with the ink to generate a desired color gamut or surface appearance. A primer coating is not usually needed for a UV-curable type of ink other than glass and comparable smooth or slippery surfaces. Pre-treatment for a UV-curable printer may entail cleaning the surface so there is no dust or oil.

primer, see **pre-treatment**. A few printer manufacturers are sneaky about priming their rigid boards the day before the show (so the end-user does not know the material has to be primed). Priming takes time, and is an additional expense. The Fuji Acuity has a barely noticeable footnote that warns you that some materials require priming with Sericol "adhesion promoter" before they can be printed with the Oce 250 or corresponding Fuji Acuity printer. Some observers report that some Sericol or Oce booth personnel are priming boards before the trade show starts and may not be telling printshop owners about this issue.

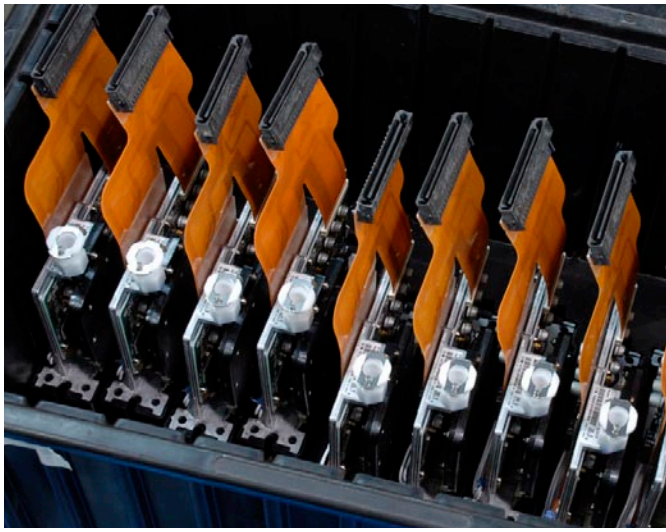
print engine is a poorly defined word often used by Epson in their ads. See also **chassis.**

printheads consist of a nozzle plate, ink feeding mechanism, electronics to trigger a piezo system all together that results in firing the ink drops that are used in UV-curing printers are made by Spectra, Xaar, Ricoh, KonicaMinolta, or Toshiba Tec. Can be spelled as one word, printhead, or two words, print head. FLAAR has separate reports on printheads for UV machines.

printhead array means a grouping of several individual printheads, usually slighty overlapping each other. Print head array today increasingly means an alignment of many individual printheads to form a "page array". A page array may consist of hundreds of individual printheads. Page array also means "one pass printing" which means the printheads don't move; only the substrate moves under the array.

printhead carriage is the mechanical assembly that carries the printheads and their accessories (heaters, ink delivery, electronics, negative pressure systems) across the X and or XY axis. In most (but not all) cases, the UV lamps are attached onto the leading and trailing ends of the carriage. On LED printers and cationic ink printers (Gerber ion), the curing lamps are not on the carriage and do not move. A printhead carriage usually moves back and forth on one axis on, or in, a gantry.

Primer container for the LexJet Legend 72HUV.


Printhead set ready to be installed in a VUTEk 320/400 FC+. VUTEk factory visit, 2008.


Printhead carriage of the Grapo Manta UV flatbed printer.

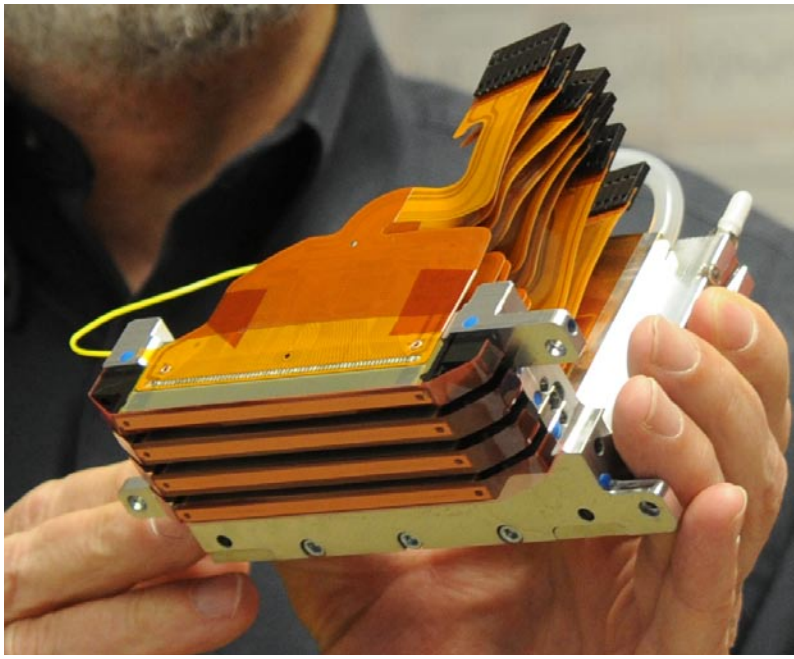
printhead page array is a term usually to describe an alignment of many (dozens or hundreds) of individual printheads that span the total width of whatever page size is intended to be printed. You need one page array per color. During 2005-2007, the average width of a page array was about 20 inches. At DRUPA 2008 many more, and occasionally wider, page array systems will be introduced.

print module is a grouping of individual printheads. There is no consistent nomenclature, and some manufacturers make up names so indicate their solution is unique. Durst calls their module a Quadro Array (which holds four individual Spectra printheads). Sometimes the printhead manufacturer makes the module, in other instances (Durst for example), they design and assemble their own module from printheads (nozzle plates) obtained from Spectra (Dimatix).

PU coating helps when printing textiles with UV-curable ink. PU = polyurethane. The Zund Operating Manual UVjet 215-C is very helpful in discussing this fact: "…PU coating that improve adhesion and prevent the ink from penetrating into the fibers."

pulsed Xenon is a kind of UV lamp technology. Oce attempted to use pulsed Xenon lamps in their Arizona 60UV printer. The output was dull matte and had other problems. The entire Oce UV development project failed (the printer had other problems besides the wrong choice for the UV lamps). Reportedly an early Vutek UV printer tried pulsed Xenon lamps as well. They, and everyone else (except Oce) use mercury arc UV lamps. NUR uses microwave UV lamps in one of their UV printers. Xenon Corp. advertisement brochures claim "The primary benefits of pulsed UV light include: deeper penetration, faster cures, less energy consumption…" But seemingly none of this helped Oce, or Vutek, very much.

purge means to force ink out the nozzles to help clean gunk out of the nozzles or off the nozzle plate. See also **bleed** and **suck**. Purging is accomplished with positive pressure (pushing the ink out). Some printers use suction (vacuum suction). Indeed some cheap Chinese printers hook up a vacuum cleaner from Wal-Mart and simply suck out the ink with a $59 shop-vac.



Dr. Hellmuth examining the Spectra Quadro Array at Durst factory in Austria. This is the print module of four heads.

When the printheads purge ink out, it generally goes into a drip tray placed below the printhead carriage in the service station. In the photo, the first generation of the Grapo Octopus purging ink.

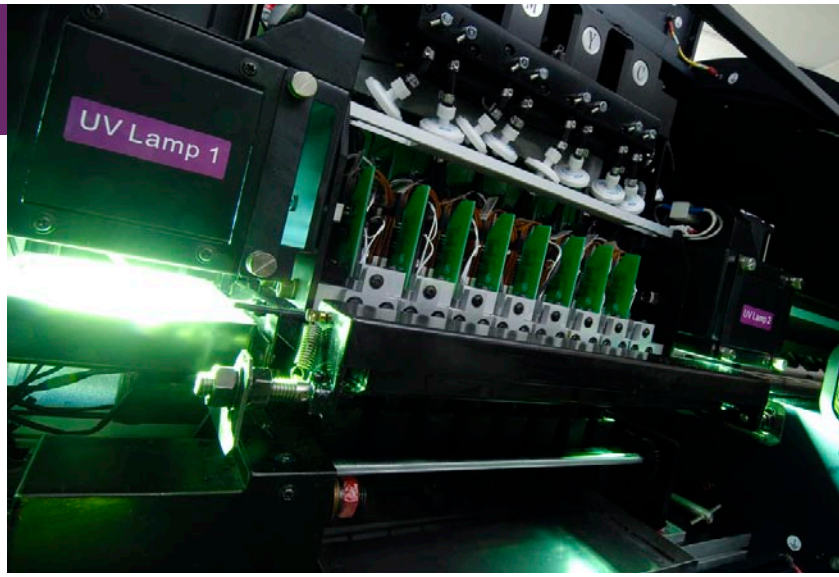
R

radiation is energy traveling at the speed comparable to the speed of light. (Snyder 2004, IMI UV conference). Visible radiation is what you see from a household light fixture. Infrared radiation is what you get inside a microwave oven. A UV-curable inkjet printer uses UltraViolet radiation. None of this has anything to do with nuclear (gamma) radiation; there is no radioactivity involved whatsoever. UV is simply a form of light.

reflectors are generally on the UV lamp assembly. They serve the same purpose as do reflectors on tungsten lamps used in photographic studios. The reflectors get dirty and need to be kept clean. Eventually the reflectors get so dark that they don't reflect any more. At this point you have to throw them away and put on a new set. This occurs about every third change of UV lamps, so about every 3000 hours (approximately). You can see with your own eyes whether the reflectors need changing. On more sophisticated and expensive printers dichroic reflectors are used to reduce heat.

remote diagnosis, some of the more sophisticated printers, such as the Luscher or NUR Tempo, have remote diagnostic capability. This means that the manufacturer's tech support system can monitor the printer and diagnosis any problems. This makes it easier for the manufacturer to assist you, via telephone, to explain to you how to repair the situation yourself. This avoids having to pay the costs of transportation and time for an actual technical engineer to come in person to your printshop. In some cases the remote diagnostics aspect is part of the RIP software as much as the capability is part of the printer's own firmware.

Rho, the Durst Rho, large, expensive, mature UV-curable ink printers. These are one of the first such printers which is out of the beta stage. FLAAR has a separate report on the Durst Rho 160 that is based on an interview of a successful print shop which owns one.



Radiation of UV light. On most secure printers, there are mechanisms to shield the radiation of the lamps so that the eyes of the operator won't get damaged.

The HP Scitex FB6100 (former NUR Tempo) is one of the few printers that offer remote diagnosis.

SFC Graphics is a print shop that owns a Durst Rho 160 UV printer.

rigid substrate means stiff, but not as rigid as in concrete. Rigid substrates often curl or have other imperfections that may cause head strikes. See also flexible.

RIP stands for Raster Image Processor software. In the past there were over 70 companies that made RIP software. Today only about 5 brands are on the FLAAR short-list (Caldera, Wasatch are two of these). There are many FLAAR Reports on RIP software. There is a difference between firmware and RIP software in most aspects. **Firmware** is made by the firm that makes the printer. RIP software is traditionally made by a company that has no affiliation with the printer manufacturer. However both Mutoh America and Mimaki have attempted to provide RIP-like solutions for their solvent inkjet printers, as has Canon for their water-based printers. I have never met an end-user who was impressed with any RIP software that was made by a printer manufacturer.

roll to roll means the material is fed from a roll, is printed upon, and then rolled up at the other end. On more simple printers, there may not be a take up roll; the printed material may just pile up at the base of the printer. Nonetheless, any printer that accepts material on a roll is called roll to roll, though this term is usually reserved for dedicated roll-to-roll designs (that cannot accept flat or rigid material). Examples of dedicated roll-to-roll printers would be the NUR Expedio, Durst Rho 351R, or the new Gandinnovations RTR model 3324. Roll-to-roll is usually hyphenated.

rub resistance see also **abrasion resistance.**

Rigid materials is the speciality of UV printers. Dr. Hellmuth holding a wooden door printed on the Grapo Manta UV flatbed printer.

Caldera is one of the most known RIP software. FESPA 07.

S

saddle is a set of two roller bars arranged next to each other with a space between them, onto which you set the roll of media. With a saddle you don't have to feed a spindle through the core. It's hard to lift a heavy roll of material to feed the spindle through it, and then you have to spend time fastening the end of the spindle with **collets**. With a

The efi VUTEk GS5000r holds the roll in a saddle. This is common in 5-meter roll-to-roll printers since the long rolls would tend to sag.

saddle you just set the material onto two adjacent roller bars, and that's all. But a saddle has no way to create tension, since the material is relatively free to move without much resistance. A saddle is primarily used on heavy-duty industrial printers 3.2 meters or wider where the weight of a roll may cause a spindle to sag. Plus, it's a headache to thread a spindle through a 5-meter long core.

Sartomer, a company providing chemicals for UV inks. The Sartomer website offers many informative White Papers and other written material on UV-curing.

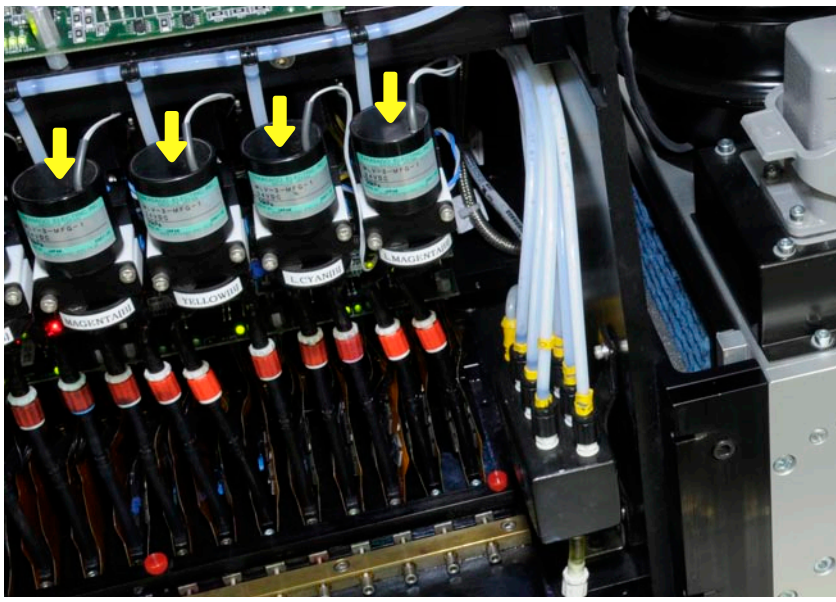
satellite drops are unwanted extra droplets that are associated with the main droplet. Satellite drops tend to fall in unwanted areas and cause what I call "edge splatter," which means that if you have a blue area and a yellow area next to each other, some blue drops will end up in the yellow area and some yellow drops may end up in the blue area. You notice edge splatter mainly on letters and lines, or where two solid colors have a sharp edge. Edge splatter is a problem with all early UV-cured inkjet printers and many poor quality UV printers still in 2006.

Scitex Vision is a company that manufactures large industrial inkjet printers. Scitex Vision was vaguely related to what was once a holding company named Scitex. Another Scitex company specialized in pre press equipment. Creo bought that part of Scitex and dropped the name Scitex. Scitex Vision is separate and continues use of the name until it was bought by HP. Scitex Vision continued to use its own name under HP ownership for an initial period, but by spring 2006 was already losing its Scitex Vision name and becoming part of the HP corporate nomenclature. Today their printers are called HP Scitex.

secondary ink tank, is an reservoir near or associated with the printhead that holds and provides ink. One advantage of having a secondary ink reservoir is so you can fill the main ink tank on-the-fly without stopping printing.

The HP Scitex TJ8500 is one of the Scitex family sold by Hewlett-Packard.

Scitex Vision CORjet. Now known as the HP Scitex FB6700



Ink reservoirs on a UV-curable flatbed printer.

service station is where most printers send the carriage assembly for servicing (cleaning the heads). The service station may be at the far left or the far right. Some printers may have a parking area at one side and also a service station area at the other side. In some cases the service station may be the same general area as the parking area.

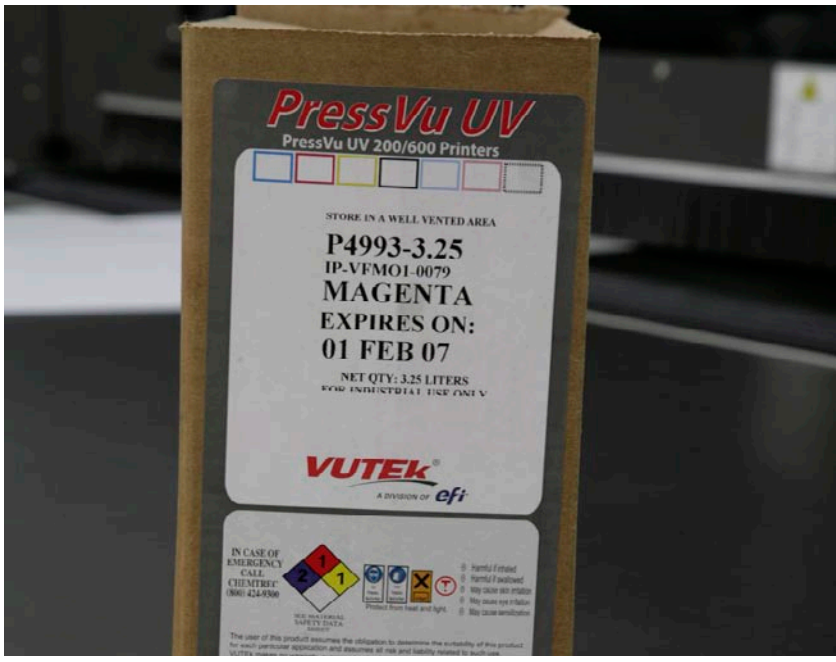
sheet fed refers to feeding the printer one sheet at a time. Or you may have an auto-loader that continuously feeds sheets. Nonetheless, it is cut sheets that enter the printing mechanism one by one. The Inca Eagle has no roll-to-roll system, so it is all sheet fed. Of course it is not "sheets" you feed a large industrial flatbed; it is a larger thicker material, but the principal and distinction of roll to roll, is the same. See also continuous fed, roll to roll. An alternative is a roll-fed machine which is cut into sheets by the machine, and leaves the machine as a sheet (not re-rolled at the other end). This is a "roll to sheet" machine. They are rare; Scitex Vision makes one. A roll-to-roll machine feeds material from a roll into the printer and winds up the printed result on another take-up roll at the other side of the printing process. This is format of a normal inkjet printer, such as Epson and HP.

shelf life means how long will a product, in this case an ink, last if unopened on the shelf.

short run printing means printing one, two, or several hundred copies. Short run printing means not doing the large minimum runs required by a screen press to be economical, or on an offset press due to the fast speed. By the time you can press the OFF button, a newspaper press has already printed several thousand copies. To prepare the screen master, it is so expensive that you have to print thousands of copies to recoup your investment. But since an inkjet printer can do either a short run of a few copies or even just a single copy, you do not have the cost of preparing a screen or the cost of thousands of unwanted copies from an offset press.

shrinkage occurs if the ink shrinks in size (because components are evaporating or whatever), then that ink may not adhere as well. Shrinkage is normal when you use free radical curing chemistry.

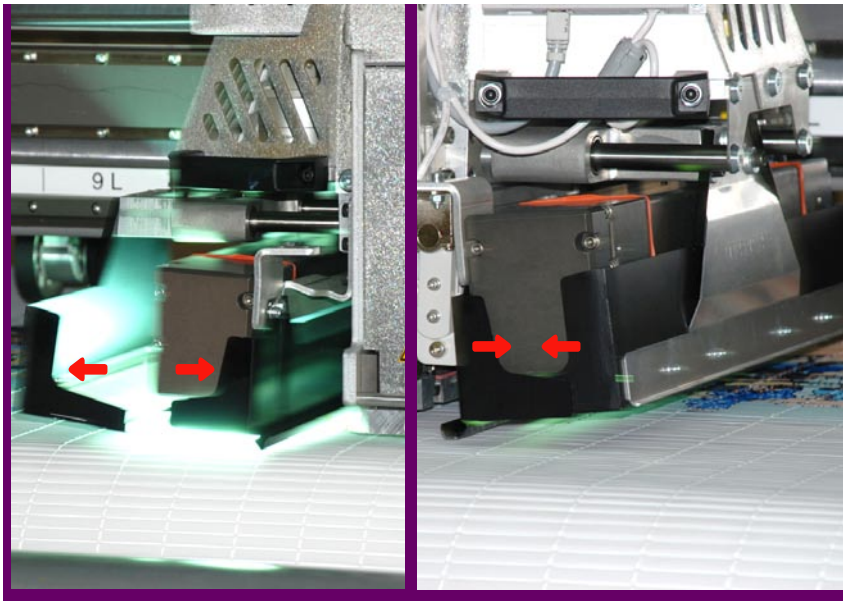
The service station of the Teckwin TeckStorm UV is at the right.



Shelf life of inks may vary from manufacturer to manufacturer.

These real estate signs are an example of short run printing. With a UV-curable printer you don't need to print a big quantity to make profit.

shutters are just that, shutters that open and close, instantly, to block off the light. You want shutters to close immediately when the lamp has reached the end of its forward path (or return path) so that the platen and nearby material are not overheated. The reason you need shutters is because you can't simply turn off the UV lamps every time you don't want their light around. If you turn off a UV lamp then you have to wait until it is cool to turn it back on. And every new strike uses up the equivalent of two to four hours of having the light still burning (so turning it off does not save the lamp or increase its life; to the contrary, turning a lamp off and on decreases its life). If you use LED lamps, however, you can turn them off and on without wearing them out and so you don't need shutters.



Shutters block off the UV light when it is not needed, instead of having to turn off the lamp. In the photo, the UV lamp shutters of the WP Digital Virtu RS35/48 in their opening and closing movements.

Sias Digital is a screen printing company whose name sometimes ends up in early lists of UV-flatbed printers. But this company should be removed from these lists totally, because Sias does not sell flatbed UV curable ink printers under their own name in America, or at least did not show one at SGIA '02, SGIA '03, or SGIA '04. Sias Digital sold their early design to Scitex Vision via Siantec, where it has been reincarnated as the VEEjet. This (and the Zund 215) are the two oldest UV-curable ink technologies still sold as current models. Both date back to the 1990's.

site preparation manual, or pre-installation guide. If you buy any printer over $100,000 you will probably need to prepare your site: upgrade your electrical capability, have solid floors, be sure the doors can open wide enough to take the crate, be sure you have space to handle not only the printer but also the materials both before and after being printed. In most cases (of a printer over $250,000) you will receive a pre-installation visit from someone from the printer distributor, manufacturer, or reseller, to inspect your premises. In most cases you will need to sign a document stating that each necessary aspect has been taken care of (for example, that you have a fork lift truck available or rented, etc).

A site preparation guide helps you know if your facilities fulfill the requirements for the optimal functioning of the printer.

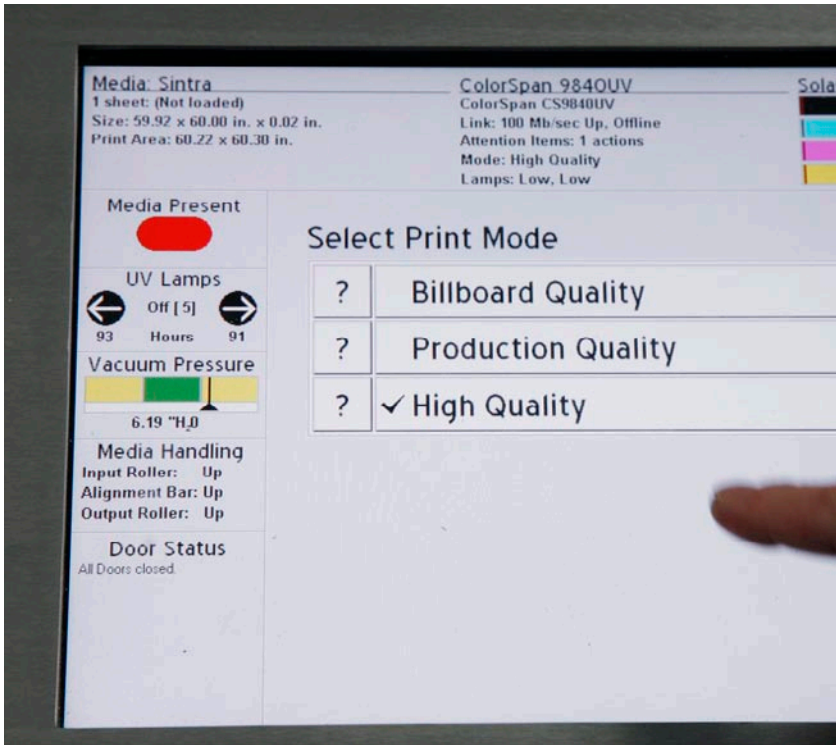
skew, is when a material goes off at a slight angle because the feeding is inaccurate. Some UV printers, including $200,000 models, may have skew is-

sues with certain sizes and kinds of materials. If the transport belt of a combo-design printer is weak, it may itself skew, thus causing media to skew too.

speed; most printing speeds that are quoted by most printer manufacturers vary from being misleading to occasionally being a lie. "Draft mode" is jargon for what I call junk mode, though as printer technology increases, there are some UV printers that can indeed produce usable output for billboards at 2-pass mode (Spuhl Virtu RS25 and RS35 can produce billboard materials at 1-pass mode due to the accuracy of their Swiss-precision. As speed decreases quality increases. This is because speed is conditioned primarily on how many passes (how many times the printheads pass over the same area to correct mistakes from the previous pass). With a Roland printer in past years, you needed to set the printer at 32 passes to achieve full quality. That showed output to a crawl. Yet ads claim "blazing speed" or some other comparable nonsense. Even when the speed claims are "true" they are based on laboratory conditions or demo room conditions (in other words idealized conditions) and not on real-life conditions in an actual printshop. Since several manufacturers do not lie, and some even include footnotes to alert the reader to reality, we try to mention these honest manufacturers when we are aware of their ethical practices.

spindle is a rod that holds roll-fed material by being fed through the hollow core of the roll of material. A machine engineer might consider a mandrel as an alternative word for some kinds of spindles in some situations. Which term you use depends to some degree on what your background is. See also **collett** and **saddle**.

spit, with many solvent ink printers, the ink system fires occasional droplets even when the machine is not printing. This is to keep the ink moving so less ink dries on the nozzle plate. With UV-cured ink, in theory no spitting is needed. Nonetheless, some UV printers do spit, especially those that have been transformed from earlier solvent ink systems. So the Flora UV printers spit, as do the Americanized Flora models: Raster Printers and DuPont. Since many User Manuals are poorly translated, sometimes spit is translated as weep.



HP Scitex FB910 UV. The speed of a printer is defined by the number of passes you set. Some manufacturers describe the number of passes in "print modes". You have to check whether the lower quality (fastest output) of your UV printer is something you can make a profit with.

The sipndle of a Grapo Octopus UV printer. Some feeding systems are physically attached to the printer. In the case of the Grapo Octopus the feeding spindle is a component that can be wheeled away.

spit gutter is the receptacle or area into which a printer spits ink to keep its heads clear. Most but not all solvent ink printers spit; very few UV printers spit, such as the Flora and Raster Printers which is based on the Flora.

spot colors are special colors, pre-mixed by the ink company, in order to achieve colors (usually needed for logos or other corporate identification) which cannot be achieved by mixing regular CMYK. Most inkjet printers do not have enough ink lines to hold spot colors and few spot colors are available anyway. See also **PMS, CMYK.**

Spectra, a leading manufacturer of industrial piezo printheads. Spectra heads are rated by everyone in the industry as lasting longer than Xaar heads, but Spectra heads cost a corresponding premium.

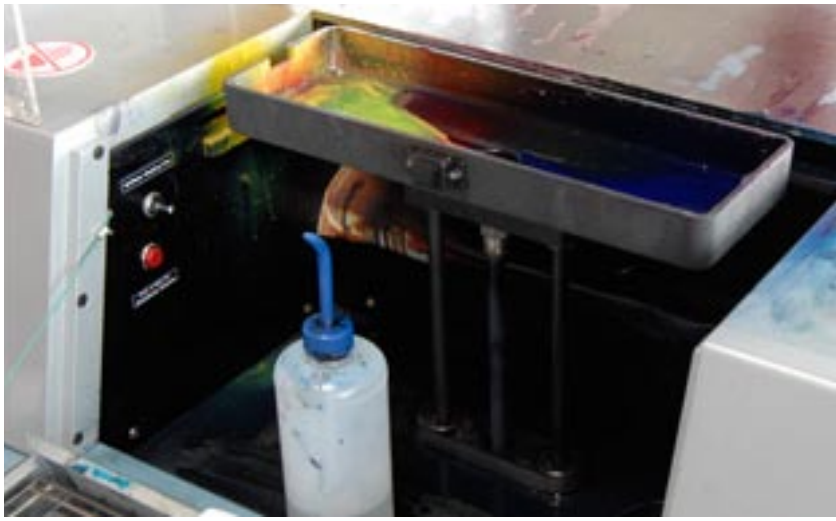
spool, the long metal rod that you run through the hollow core of a roll of material.

spraying This is an undesired feature of some UV-curable ink systems because the ink particles are a health hazard. If the ink raises a mist, it can easily float through the print shop because the printers are by no means hermetically sealed. Also known as misting.

square feet per hour is the amount of material that can be printed in one hour. The sum claimed in a spec sheet may be misleading, especially when it does not include the time for cleaning the substrate, loading, and unloaded.

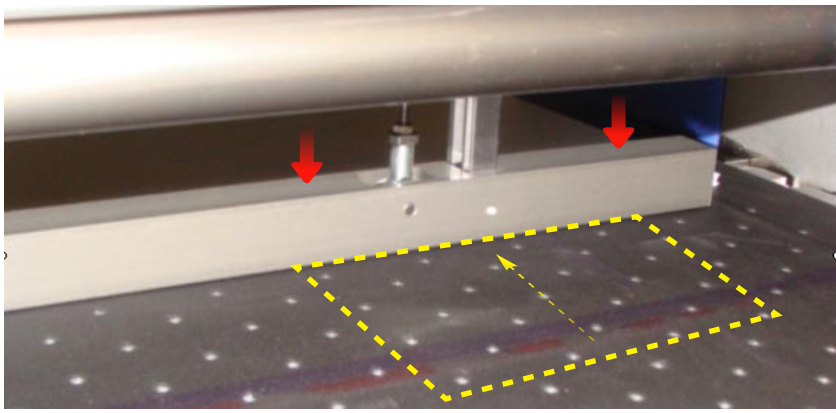
starter set of inks means ink in small containers, so that you have to buy fresh ink fairly quickly after you have just paid for the machine. A starter set has just enough ink to turn on the printer and use it for a few trial runs.

stop-bar, is a horizontal bar the full width of the media that can be lowered into the media path. When you insert a fresh piece of rigid material you need to line it up against something to make it square to the table. So you use a stop bar at the end combined with a separate guide bar at the left.



This is an example of spit gutter

Dr. Hellmuth holding a pack of Spectra heads.



The stop bar or registration gate is lowered and then flat boards can be aligned against it.

There is no formal name for either the stop-bar or the guide bar. Vutek calls this a “fence.” Other printer manufacturers have their own names for a similar feature. See also **gate**.

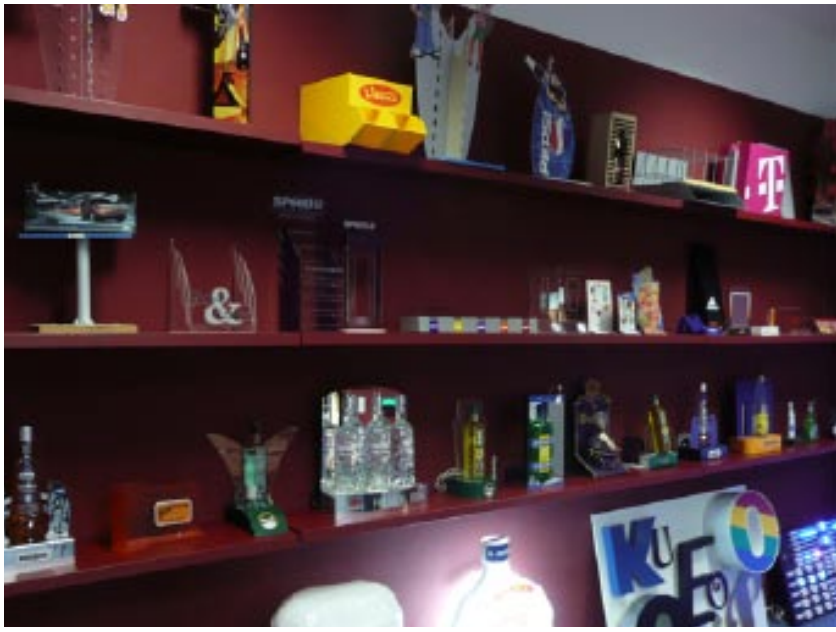
substrate, a material onto which you can print with UV-curable ink which does not have to be coated. If the material is coated, it is called media. The substrates that printer manufacturers tend to mention as compatible are:

- Artboard
- Cardboard, especially for boxes
- Ceramic tiles
- Foamboard
- Foamex
- Gatorfoam
- Glass
- Metal
- Plexiglass
- PVC
- Sintra
- Styrene
- Vinyl
- Wood

Specialty items include leather and stone, among others.

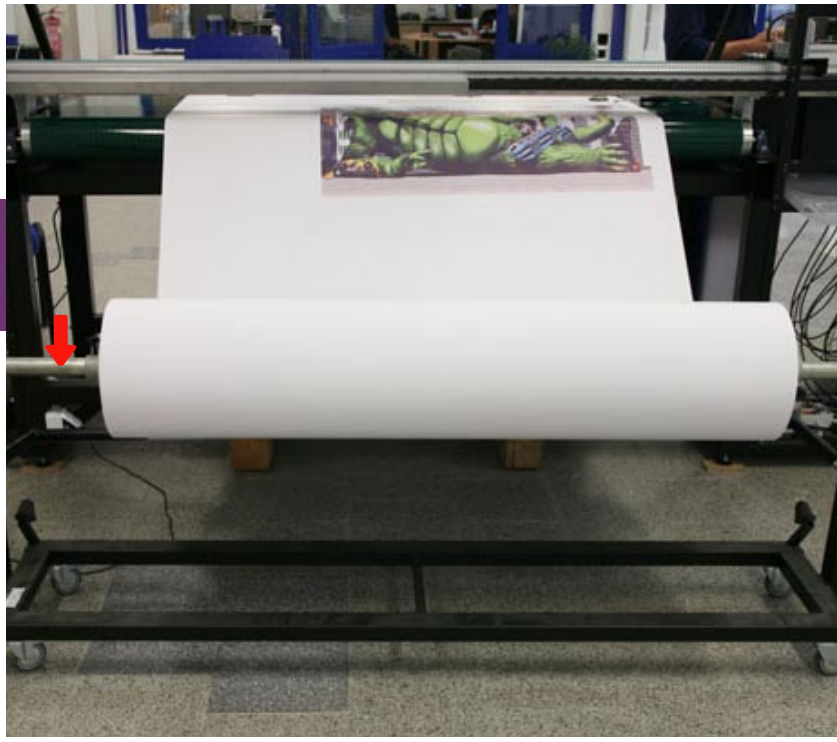
suck, meaning to suck ink out the printhead by vacuum from below, as opposed to pushing the ink out with air or pressure from inside the ink delivery system (pushing the ink out is called **purging**). See also **bleed**. Cheap Chinese printers, to avoid the cost of installing a printhead cleaning system inside the printer, they simply get any low-cost home vacuum cleaner, and suck on the printheads with this vacuum cleaner. But don’t laugh too soon. Other mid-range and even high-end UV printers are realizing this is a low-cost option. I have seen one perfectly respectable brand using a vacuum cleaner too.

surface tension relates to the freshly landed ink droplet on the surface of the material, and how, or whether, it spreads out before it is cured by the UV lamps. Each ink chemistry has preferred surface tension, so UV ink and solvent ink each have a different surface tension that is better for that ink.



If you visit Grapo factory, they have one of the most impresive displays of substrates that have been printed with their UV machines.

surfactants are chemicals needed in inkjet ink to handle the wetting situation of the printhead nozzle face plate. For details see various IMI conference proceedings.



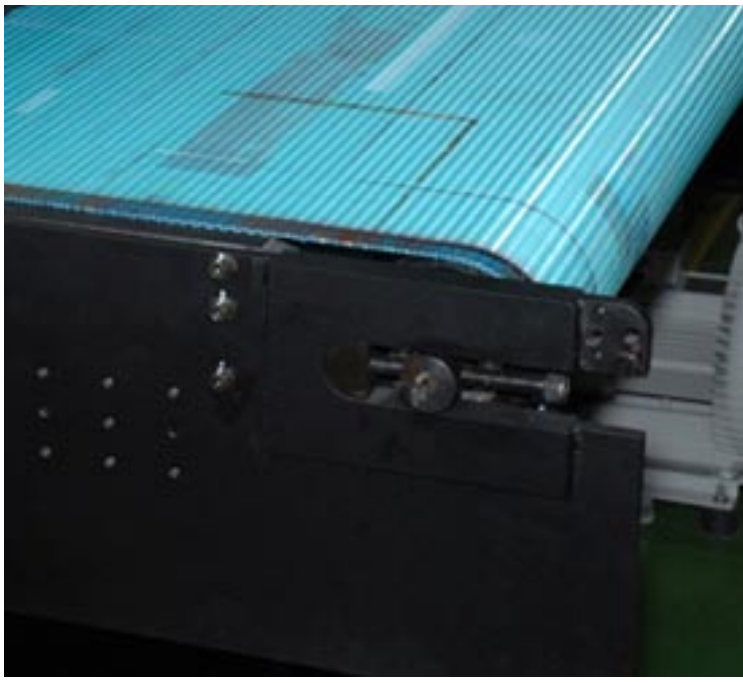
Once printed on, the roll-fed material is collected on the take-up reel. Grapo Octopus UV printer at Grapo factory visit.

T

tape test is a common simple test for adhesion: you scratch the surface of the ink with a metal instrument. Then put 3M tape over the area. Lift off the tape. If you ink comes with the tape, you have poor adhesion.

take-up reel, or, take-up roller is present on sturdy inkjet printers that are intended for commercial production. A low-end cheap printer may not have such a reel (unless you pay extra). On some take-up systems you have to feed the material yourself and physically attach it to the take-up reel. In the better and more costly printers the take-up reel may work automatically. The downside of most take-up reels is that you lose one or more yards/meters of expensive material, since on most printers you can't start your print job until the material is pulled through by hand and attached to the reel. See also capstan, dancer bar, gimble, feed roller.

transport belt, may informally be called a conveyor belt, but it is really just a single wide belt. What holds the material (being printed on) to the belt is a vacuum. Some transport belts have a rough surface or otherwise a surface that will transport whatever material is put on top. However other transport belts are smooth. A transport belt is used instead of pinch rollers acting against grit rollers, though a few combo printers with transport belts may also have a pinch roller or pinch-like bar. The first popular UV printer that used a transport belt is the Zund 215-C. However this Zund is the only transport belt that has to be rewound; it is not continuous. Most printers that use a transport belt are called a "combo printer" in the FLAAR classification. Printers that have a rigid platen with pinch rollers and grit rollers tend to be called a **hybrid** printer. The transport belt is not really a conveyor belt (because there is usually only one short belt) and is not really a transfer belt. There is no formal nomenclature, but we have settled on transport belt.



Texture in a transport belt helps materials adhere to avoid problems such as skew.

U

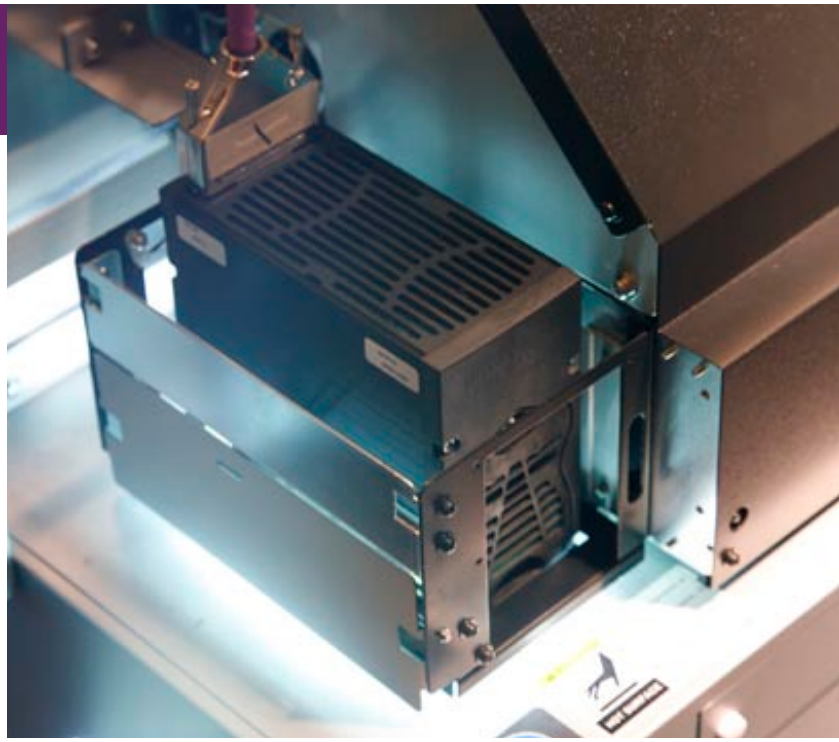
undercoat, is not a standard term; it is usually called an inkjet receptor layer, the minute layer of chemicals which receive the inkjet ink and facilitate a reaction which results in the color and quality that users expect nowadays. However, since UV curable ink does not require an inkjet receptor layer, our discussion of this subject is in the glossary and other reports in the FLAAR series on **media**.

uni-directional or unidirectional means that the printhead is printing ink only when moving in one direction. When it reaches the end of that pass, it returns to the starting point without printing. In bi-directional printing, the ink is jetted both coming and going, so the results are faster. See also **bi-directional printing**.

UV is standard abbreviation for ultraviolet. For inkjet printers, it means that UV radiation is used to turn the ink from a liquid (squirted from the nozzle) into a solid ink film on the substrate.

UV-curable inks are pigmented inks that dry instantly when UV light is turned on the ink. UV light is supplied by lamp fixtures on the printer and the UV curing is performed by special photoinitiator chemicals inside the ink. UV curable inks are capable of sticking to most (but not all) surfaces including glass and ceramics. The ink is jetted through regular Xaar or Spectra piezo printheads and then solidified instantly by the UV curing lamps. UV-curable ink is made by Avecia, Coates, Sericol, SunJet (Sun Chemical), and others. Often it is rebranded so you do not really know who originally produced it. Formulas change from time to time, since the chemistry and curing is still a developing technology.

UV inks. Do not confuse true UV-curable inks with HP's misnomer, "UV inks." HP inks are normal, water-based pigmented inks. Trade magazines and seminar discussions suggest that the good pigmented inks of this kind are made by Du-



UV light is used to initiate the chemical reaction that solidifies the ink in the substrate.

UV ink containers of the Grapo Manta UV dedicated flatbed printer. As you see, most containers, hoses and tubes are dark because UV ink is sensitive to sun light.

Pont. These HP inks are not UV cured. No other pigmented ink calls itself UV. So that HP misnomer should be politely changed to simply pigmented ink, so as not to give the wrong impression to people. Even at industry level conferences, people are confused, so I can guess that a normal end-user might be also. True UV-cured inks are a completely separate species. We recommend that you obtain the reports from IMI (http://imi.maine.com; recently they have created a new web site, www.imiconf.com. These reports cover UV-cured inks in full detail. UV inks are currently available only for industrial inkjet printers. However, Mimaki may produce the first regular sized inkjet printer with UV-curable ink capability. HP began using the designation UV inks before the similar UV-curable ink phenomenon became so popular; there is no deliberate attempt that we know of, to imply that their UV inks are UV-curable. It is just a case of bad luck that UV-curable became so well known under that moniker.

UV ink bottle of an Infiniti UV hybrid printer.

V

vacuum table is a vacuum plate with holes in it, a flat surface with a vacuum pump underneath or alongside so that any flat material will be sucked and held flat. Vacuum tables are very expensive and do not suck things flat anyway (at least not to our satisfaction). We would have to see each vacuum table by brand and model to certify them, or not, as the case may be. Nonetheless, a good vacuum table is perhaps better than no suction at all.

Virtu, a model designation for L&P combo style flatbed printers. For a while sold by 3M. In Europe sold by Spuhl. Today Virtu is sold by WP Digital.

viscosity, inks must be very low viscosity at the point that they jet through nozzles on printheads. But the inks themselves (in their original ink container) may be of high viscosity or low viscosity. The ink then is heated to prepare the viscosity for the optimum firing through the printheads.

Gandinnovations 3150 UV vacuum table.

VOC, Volatile Organic Compounds, UV-curable inks have low or "no" VOCs. However, UV curable ink prints do produce objectionable odors, they do not have a well-known abbreviation such as VOC. "Most of the photoinitiators release photodecomposition, products that are volatile and release unpleasant odors." (Klang and Balcerski 2002:7). However, those authors list newer products that are less offensive.

VUTEk is a company that started out making airbrush printers, then industrial billboard printers, and now, has added UV curable ink flatbed printers. Vutek is a successful American company that sells worldwide. Vutek is owned by EFI (software company) and is associated with their own ink company, InkWare.

Vutek company manufacture section

W

waste ink is the ink that is purged, sucked, or otherwise wasted during cleaning the printhead nozzles. Waste ink can also come from miscellaneous dripping of ink from the heads during pauses or parking. Waste ink can also happen during periodic spitting of ink (to keep ink moving through the nozzles every so often, to avoid clogs). Cheap printers collect the waste ink in an open tray; you just dump it in your waste container. Expensive printers have a waste ink bottle that holds several liters. If your printer uses an integrated solvent flush solution, this flush liquid also collects in the waste container.

Waste ink goes into a drip tray, and then into the waste ink container. Teckwin TeckSmart 1600 UV.

water-based UV ink systems have the problem of how to get rid of the water in the ink in milliseconds during the process of UV-curing.

water cooled means the UV curing lamps are cooled by water because if air-cooled, the air might blow the drops of ink off track as they are been jetted from the nozzle.

wetting (pigment wetting); this is not the same as face plate wetting on a regular inkjet printer. Wetting with UV-curable ink has to do with surface energy.

white ink can not be printed by any regular water-based inkjet printer. Metallic colors are also hard to jet through printhead nozzles. However, the Aellora, Durst Rho, and Mimaki UV-curable printers could print white ink. Printing white ink is necessary to print on transparent material and is used as overlay on instrument panels. White ink usually includes Titanium Dioxide, which does not maintain suspension unless stirred. There is an entire separate FLAAR Report on white UV ink, where the next update will discuss the following modes

- Single hit white
- Double hit white
- Under spot with white
- Over spot with white
- Under print with white
- Over print with white
- Special effects white

Other terms include flood coat and fill coat (in other words, the same mode is called several different names depending on the background of the person or company naming the mode).

white-skip means the software will instruct the printhead carriage to skip large areas of white space in order to make overall printing time faster.

wiper, a wiper blade is intended to wipe detritus and ink off the nozzle plate. The wiper system exists on some solvent printers and on some UV-cured inkjet printers (in the service/maintenance station). A wiper (in this definition) is part of the printer hardware and is activated by a button or software command. If you wipe the nozzle plate yourself this is wiping but is usually with a cloth, not a blade. Naturally the “blade” is not sharp and may even be of rubber or plastic. By no means is a wiper system standard or even common.

White ink sample

GCC 250 wipers service area.

X

Xaar, a well known company that makes industrial piezo printheads. Xaar is a competitor of Spectra. Xaar heads cost much less, last nowhere near as long as other piezo heads. Most printers with Xaar printheads have banding issues, but this could also result from inaccurate feeding of the media. Many printer manufacturers have switched from Xaar to Spectra heads, but you don't hear of too many companies switching from Spectra to Xaar. Xaar does not any longer make bad heads, they are simply not as sophisticated, and less cost, in the sense that you get what you pay for. But several other companies, such as Toshiba Tec and Konica, license the Xaar technology, including grayscale technology, and are able on their own to produce inkjet printheads of higher quality than Xaar itself.

Dr. Hellmuth discussing printheads with Xaar staff.

x-beam, this is the horizontal structure along which the printhead carriage travels. X-beam is a term used by NUR; I don't see the same term emphasized in other manuals.

Xenon pulse is a special kind of lamp for UV-curing. These are also called "flash" lamps. So far one of the few UV printers that attempted to use this lighting was the Oce Arizona 60UV, which failed to produce adequate gloss or even an impressive color gamut. Reportedly VUTEk experimented with trying to use Xenon pulse UV lamps in their first generation UV printer, when still switching a solvent flatbed to become a UV flatbed. These Xenon pulse lamps did not work for VUTEk either, and they switched to traditional mercury arc UV lamps very quickly.

Z

Zünd is usually just spelled Zund in American English. A Swiss company. With the umlaut the company is pronounced Zuend. They produce a functional, albeit relatively basic, flatbed combo UV curable ink printer.

Zünd company manufacture section

Bibliography

Sources and Resources on the Internet for Inkjet Glossaries

Dozens of glossaries of inkjet printers and inkjet inks exist. Many simply plagiarize the others. Yet some are the original and very helpful. You would have to spend many hours figuring out which are originals and which are the uncited copies. We do not yet rate them.

www.dpia.org/glossary/u.html
A long glossary; each definition is very short. No illustrations.

www.jnevins.com/inkjetglossary.htm
“Inkjet printing and ink formulation,” by Jerry Nevins.

www.sartomer.com/wpapers/1070.pdf
A glossary specifically on UV.

www.sgia.org/glossary
A long glossary; each definition is very short. No illustrations.

Most recently updated May 2009.

First issued 2003. Updated February 2004; updated April 2004; updated June 2004, updated December 2004, updated May 2005, October 2005, November 2005, June 2006, February 2007, June 2007. April 2008, June 2008.

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.

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

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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 15 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, Raster Printers (EFI Rastek), DEC LexJet, DigiFab, Barbieri electronic, Mutoh Europe, IP&I, Dilli, Yuhan-Kimberly, GCC, Grapo, Durst, and WP Digital for providing funds so that we can make more of our publications free to end-users. During 2000-2001 we had grants to cover all the costs of our publications, and all FLAAR Reports were free in those early years. As that early grant naturally expired after a few years, we had to begin charging for some of our reports to cover costs. Now (in 2009), we are seeking corporate sponsorship so we can gradually make another 20% of our publications free to our readers.

Since 2006 we do a major part of our evaluations at a factory and headquarters demo room. Since the university does not fund any of these trips, it is traditional for the manufacturer to fund a research sponsorship. In the US this is how most university projects are initiated for decades now, and it is increasing. In fact there is a university in Austria that is not an “edu” but is a “GmbH”, funded by the chamber of commerce of that part of Austria. In other words, a university as an educational institution, but functioning in the real world as an actual business. This is a sensible model.

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

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

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

We thank 3P Inkjet Textiles and HP for providing inkjet textiles so we could learn about the different results on the various textiles. IJ Technologies, 3P Inkjet Textiles, ColorSpan, Encad, HP, Nan Ya Pepa, Oracal, Tara and other companies have provided inkjet media so we can try it out and see how it works (or not as the case may be; several inkjet media failed miserably, one from Taiwan, the other evidently from Germany!). We thank Aurelon, Canon, ColorGate, ColorSpan, ErgoSoft, HP, PerfectProof, PosterJet, Onyx, Ilford, CSE ColorBurst, ScanvecAmiable, Wasatch and many other RIP companies for providing their hardware and software RIPs.

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

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

We really liked some of the results whereas some of the other products were a bit disappointing. Providing samples does not influence the evaluations because the evaluators are students, professors, and staff of Bowling Green State University. These personnel are not hired by any inkjet printer company; they were universities employees (as was also true for Nicholas Hellmuth). The testing person for the HP ColorPro (desktop printer) said he frankly preferred his Epson printer. When we saw the rest results we did not include this Heweltt-Packard ColorPro printer on our list of recommended printers, but we love our HP DesignJet 5000ps so much we now have two of them, one at each university.

Sometimes we hear horror stories about a printer. The only way we can tell whether this is the fault of the printer design, or lack of

training of the operator, is to have the printer ourselves in-house. Of course some printer manufacturers don't understand the reasons we need to have each make and model; they are used to loaning their demo units for a week or so. That is obviously inadequate for a serious review.

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

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

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

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

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

Grant funding, sponsorship, demonstration equipment, and training are supplied from all sides of the spectrum of printer equipment and software engineering companies. Thus, there is no incentive to favor one faction over another. We receive support from three manufacturers of thermal printheads (Canon, ColorSpan and HP) and also have multiple printers from three manufacturers of piezo printers (Epson, 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.

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

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

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

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

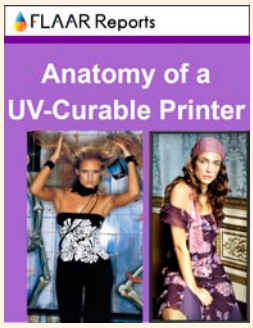
A modest portion of our income comes from our readers who purchase the FLAAR series. All income helps continue our tradition of independent evaluations and reviews of inkjet printers, RIPs, media, and inks.

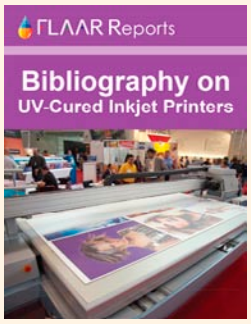
These are some of the most

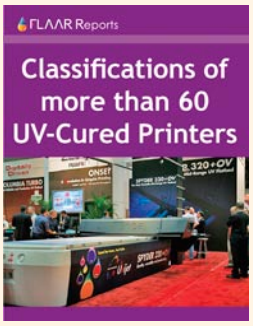
Recent FLAAR Reports (2007-2009)

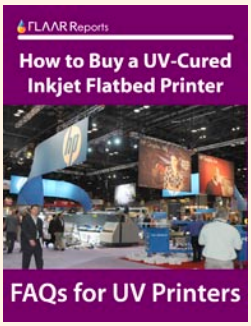
You can find these and more reports at: www.wide-format-printers.NET

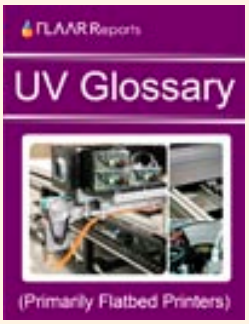
Introduction to UV Curable Inkjet Flatbed Printers

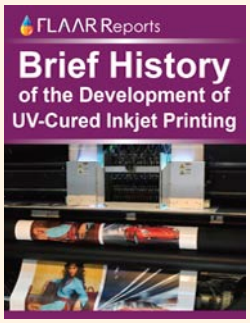


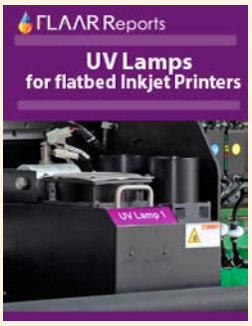


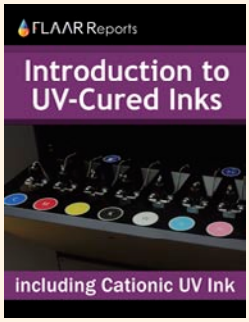












Comments on UV Inkjet Printers at Major Trade Shows 2007-2009

These are some of the most

Recent FLAAR Reports (2007-2009)

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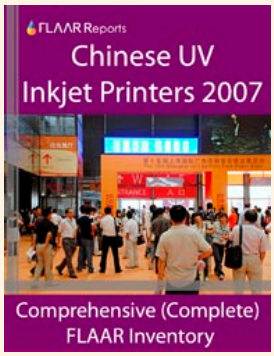
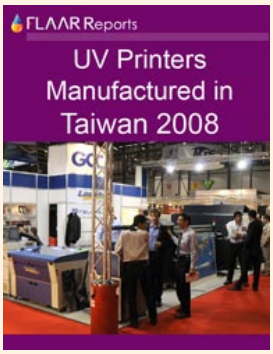
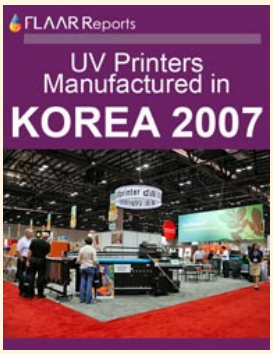
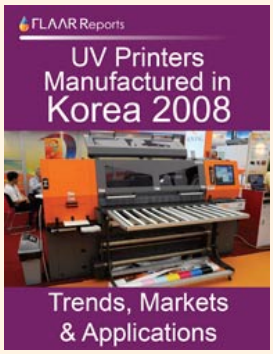
UV Printers Manufactured in China, Korea and Taiwan









Most recent UV Printers