



# GLOSSARY

## Terms Related to X-Y Flatbed Cutters





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*Spider cut-out created on a Kongsberg flatbed cutter, at i-cut (Esko Artwork) demo room, Lake Geneva, Wisconsin, 2009.*

## Introduction

### This glossary is for sophisticated XY flatbed cutters, not trimmers; not just roll-fed

We do not yet cover roll-fed cutters that are not contour cutters. So do not cover Durst Autocutter 62 XY or any of the other OEM versions of Fotoba products. If the manufacturers of trimmers and roll-fed slitters express interest, we can include them, but presently their products are not included from the first draft. The GerberScientific.net web site does not allow you to download their manuals, so I am not able to refer to Gerber M Series cutter very often.

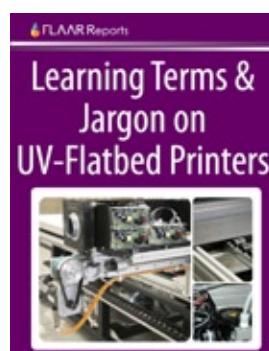
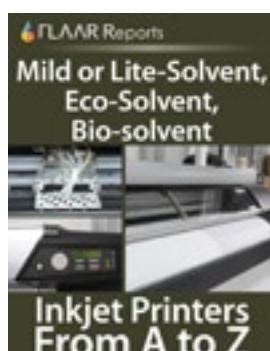
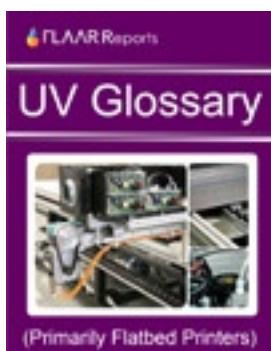
This glossary does not focus on simple roll-fed vinyl cutters since simple vinyl-cutters tend to be used by printshops that already have years of experience with these. This glossary is to assist in understanding flatbed cutters so does not cover Summa, Roland, Ioline, GCC, Graphtec, etc.

This glossary of CNC routers and digital XY cutters is, to our knowledge, the first such glossary of digital XY cutters in the world (surely others exist, but we have not yet found them). As soon as we find other digital flatbed cutter glossaries we will cite them in the bibliography. Naturally there are already glossaries and descriptions of CNC routers since these industrial machining tools have been around since the last century. CNC Department, History and definition of CNC, TOOLINGU is an example of a resource for CNC jargon.

Of course now that this FLAAR glossary is available, it is natural that others will copy the idea even if not all the content, but we ask that the FLAAR original be licensed (if used) and credited as inspiration (even if not copied in its totality). Citation of the work of others is a mark of ethics, as well as fairness.

The idea for a glossary was because FLAAR is first and foremost an institute dedicated to education (which is a result of Dr Hellmuth's resume as having been a Visiting Professor on several campuses in his career). He noticed the rise in the need of digital XY cutters for diverse applications but there was no resource anywhere to help provide a general introduction. Trade magazines published nice lists of manufacturers of cutters, but had no exhaustive definition of all the different kinds of cutters. And trade magazines, since they depend on advertising and PR releases, can't really discuss the downsides, deficiencies, and weaknesses of any particular brand or model. But an evaluation institute that has its own inherent concern about a technology, and which wishes to learn the pros and cons for its own interest in cutting (for museum displays and for architectural uses in the case of FLAAR), not only can learn the plusses and minuses of any machine, but needs to learn the pros and cons in order to decide what system to use for its own applications.

Once we learn which technology is optimal, and which brand and model offer ideal features, then we publish our own results for others to benefit from our research and experience. Presently (September onward) we are evaluating Kongsberg flatbed cutters and vision software from Esko (MGE, *i-cut*). So it was ideal timing to produce a glossary based on our present research. It takes an entire team to prepare, design, issue, and manage distribution of any report. Thus we appreciate the funding of our research on flatbed cutters by Esko. Our staff is currently 19 because our readership is up over 21% this year over last year; even during the recession FLAAR is hiring, not firing. We estimate that several thousand people a month will download this FLAAR Report on flatbed cutters.



**This edition is the first edition:  
updates will be coming later this year and more updates in 2010**

All FLAAR glossaries go through many stages. Most of the illustrations in the following pages are from Kongsberg cutters since it was possible to study them at their Esko demo room in Lake Geneva a week ago. It would have been nice to inspect other flatbed cutters also, but no inspection visit has yet happened with other brands. On my own initiative I did visit MultiCam router company, but the manager that facilitated this visit did not allow any photography when I was in their Dallas factory two years ago. I have visited two Gerber factories, but in Connecticut, so these were not for their M Series cutter.

I was introduced to the CEO of Aristo cutters at Sign Africa in early September and when I was inspecting the MultiCam digital cutter in Paris VISCOM '09 the person who came over to answer my questions turned out to be the President of MultiCam. So perhaps in the future it will be possible to add more photographs to an upcoming enlarged edition of this glossary. Nonetheless, here is the initial edition of the FLAAR glossary with photographs taken by FLAAR with permission of Esko during my visit to their demo room.

Note that FLAAR has glossaries of virtually all aspects of digital imaging.

### The work that stands behind this glossary

During summer 2009 it was possible to visit DGS printing company in Bloomington, Illinois, to undertake several site-visit case studies of various printers (FLAAR prefers to do its evaluations in actual printshops so we can see how a machine functions out in the real world). DGS was selected because it was not far from the FLAAR office in St Louis (Missouri), because DGS had a brand new Seiko S-104s printer, a brand new Drytac VersaCoater, and also several other recent models of other printers. Once I got there, it turned out they also had a Kongsberg i-XL model of XY cutter-router with a conveyor belt.

Then in September I visited DGS again to check and see how their equipment was performing, and I inspected the Kongsberg while cutting basic signage. I also got to see how it had recently cut through dense MDF boards. Then the next day I was at Print '09 where there were two Kongsberg printers at the show. The following day it was possible to spend eight hours at MGE world headquarters, the (i-cut vision system, part of Esko Artwork, an hour north of Chicago).

A next week it was possible to spend three days inspecting a dozen brands of CNC routers and XY flatbed digital cutter-routers at VISCOM Paris '09. The week after this I was at T-Rex trade show in Kiev, Ukraine and could speak with the Kongsberg distributor for that part of the world. Since flatbed cutters are becoming popular due to increased sales of UV-curing flatbed inkjet printers, I prefer to undertake research around the world.

There are Kongsberg cutters even closer to the FLAAR office, so as soon as I return from the autumn trade show inspection season, I will visit other printshops and do further evaluations (which will result in more photographs and illustrations for this glossary). In the future I hope to visit Kongsberg facilities in Norway for additional training. So you can look forward to several updated editions of this glossary.

Obviously eventually other glossaries will appear, but the FLAAR Reports edition will keep improving (we have a staff of 19 people). Plus, ours is now the first major published edition on digital flatbed cutters for UV printed materials (though I am sure eventually we will find earlier glossaries of traditional routers or cutters for textiles, leather, etc). But our long range interests are far more than just cutting fabrics.

FLAAR Reports glossary of digital flatbed cutters  
for signage, display, furniture, décor, and packaging



*Dr. Nicholas Hellmuth with Harvey Meister, owner of GDS printshop; evaluating a Kongsberg MultiCUT at his recent site-visit.*

**A**

**acceleration**, rate of change in velocity. If you are cutting a lot of material 24/7, then you need a brand and model that has high acceleration. If you are cutting only samples just a few times a day, you need less acceleration. With a digital flatbed cutter you will also learn to handle velocity, depth of cutting, tool-up angle. For kiss-cutting tools you may handle knife pressure.

**alumicore**, plastic corrugated core and thin aluminum facing.

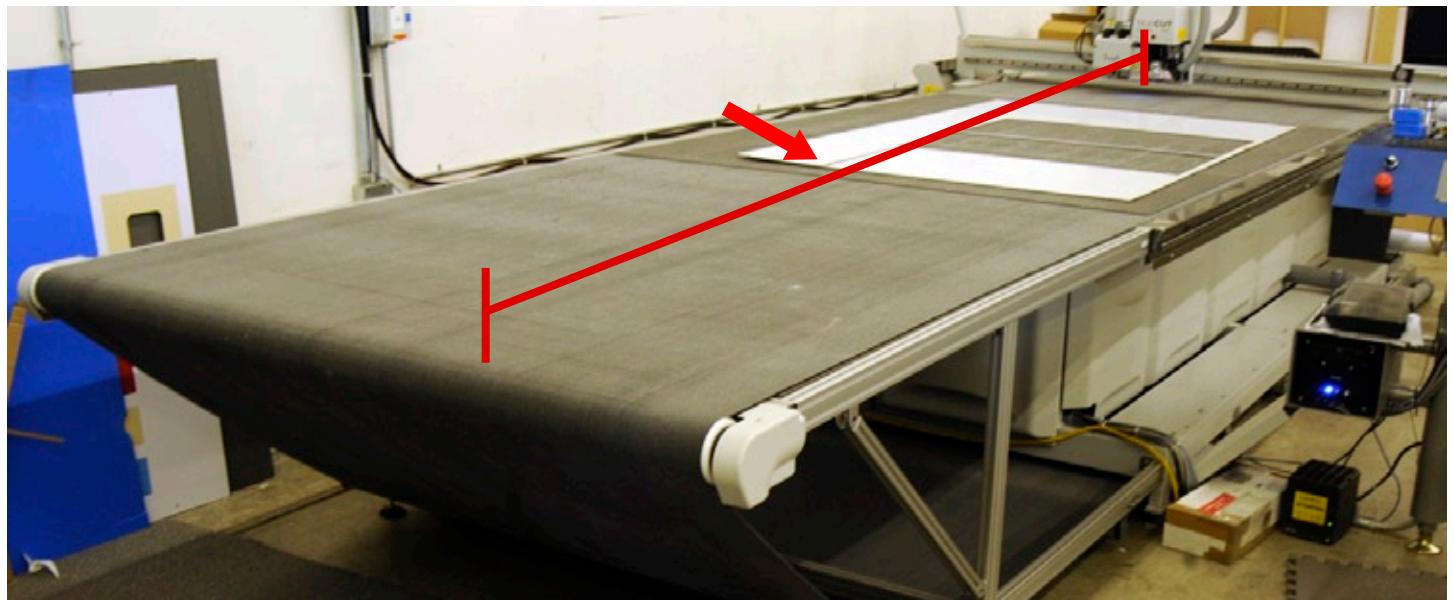
**ARS**, Automatic Registration System. (Kongsberg XP User Manual)

**ArtiosCAD** a CAD system very much used in the packaging as well as display industry. Developed by Esko Artwork.

**axis**, an imaginary straight line through the center of a space or the center of an object (or flatbed table). But in cutters and printers the X-axis is perpendicular to the Y-axis. The Y-axis is the left to right movement of the printhead carriage on a flatbed printer or the side to side movement of the tool head carriage on a flatbed digital cutter. The Z-axis is up and down.

**B**

**belt** for **flatbed cutter**; means a conveyor belt (same as a transport belt), to move material from a loading area towards where the material can be cut, as well as transportation after cutting.



*The conveyor belt option is dedicated to transporting the cut media.*

**bevel-cut** means **V-notching**. You use this tool for Re-Board, X-Board (Xanita), BioBoard, etc to make chairs, tables, bookshelves, etc.

**bevel knife** tool, a tool for making bevel-cuts. Bevel-cuts in thick heavy materials like Re-Board requires strength not normally available with tooling for cutting thinner and softer materials.

**bit**, cylindric tool used for milling, compare with **blade**.

**blade**, compare with **bit**.

**blower unit**, provides vacuum adhesion of the workpiece on the cutting panel. (Flat bed cutting ploter CF3-1631 and CF3 16-10 Operation Manual, Mimaki)

**brushless AC servo motor**, is what you want to handle the motion of your gantry (not an antiquated stepper motor).

**C**

**CAD**, Computer-Aided Design.

**camera detection**, automatic detection of register marks for accurate cut to print alignment. Based on camera and image detection software.

**CNC**, Computer Numerically Controlled. (see **computer numerical control**). See **CNC routers**.

**CNC cutters**, CNC machine used for cutting.

**CNC routers**, a CNC router is a relatively old-fashioned machining system for routing metal (aluminum, brass), thick heavy wood composite materials (MDF), plywood, and solid wood. MultiCam would be one example of dozens of manufacturers of this kind of equipment around the world.

**computer numerical control**, A type of programmable automation, directed by mathematical data, which uses microcomputers to carry out various machining operations. (CNC Department, History and definition of CNC, TOOLINGU)

**contour**, curved edge surface that you cut to create your final object.

**contour cutting**; see also **die cutting**, **kiss cutting**.

**contour nesting** means having the outline (shape) of each component being able to nest close to any other appropriate shape. Otherwise you get regular nesting which wastes all the material between the edge of the design and the edge of the rectangular shape of the printable sign.

So contour nesting means nesting non-rectangular images.

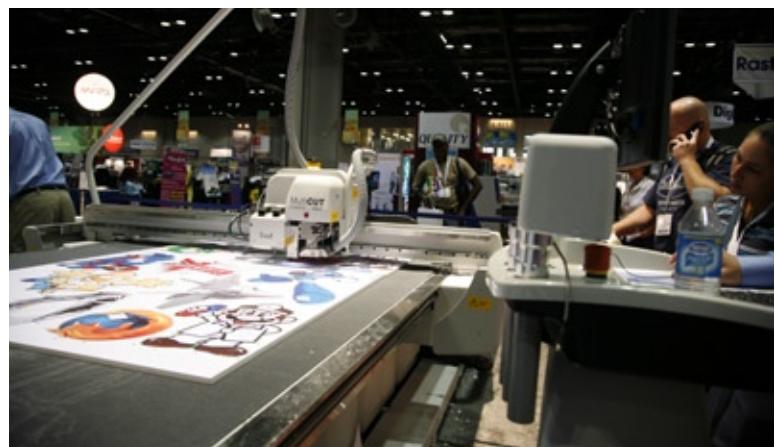
Most printer operators know how to use a nesting function in a RIP software, or sometimes in the firmware of the printer. You take different print jobs of small dimensions and arrange them sideways or however, so that they all fit across the full width of your material. So you can fit one print job of 2 meters and another print job of 1 meter across a 3.2 meter printer (and have space to spare).

Basic nesting (which is not contour competent) is straightforward; all RIP software can handle this.

But what if the print jobs are parts for a table, chair, bookcase or other furniture? Only a few of these are rectangular. So how do you nest them? Your RIP software will take the maximum width and length and nest them as a full rectangle. This means you can't get the images to occupy empty space of an adjacent image. Some advanced nesting software like SignUp from Esko Artwork can do contour nesting.



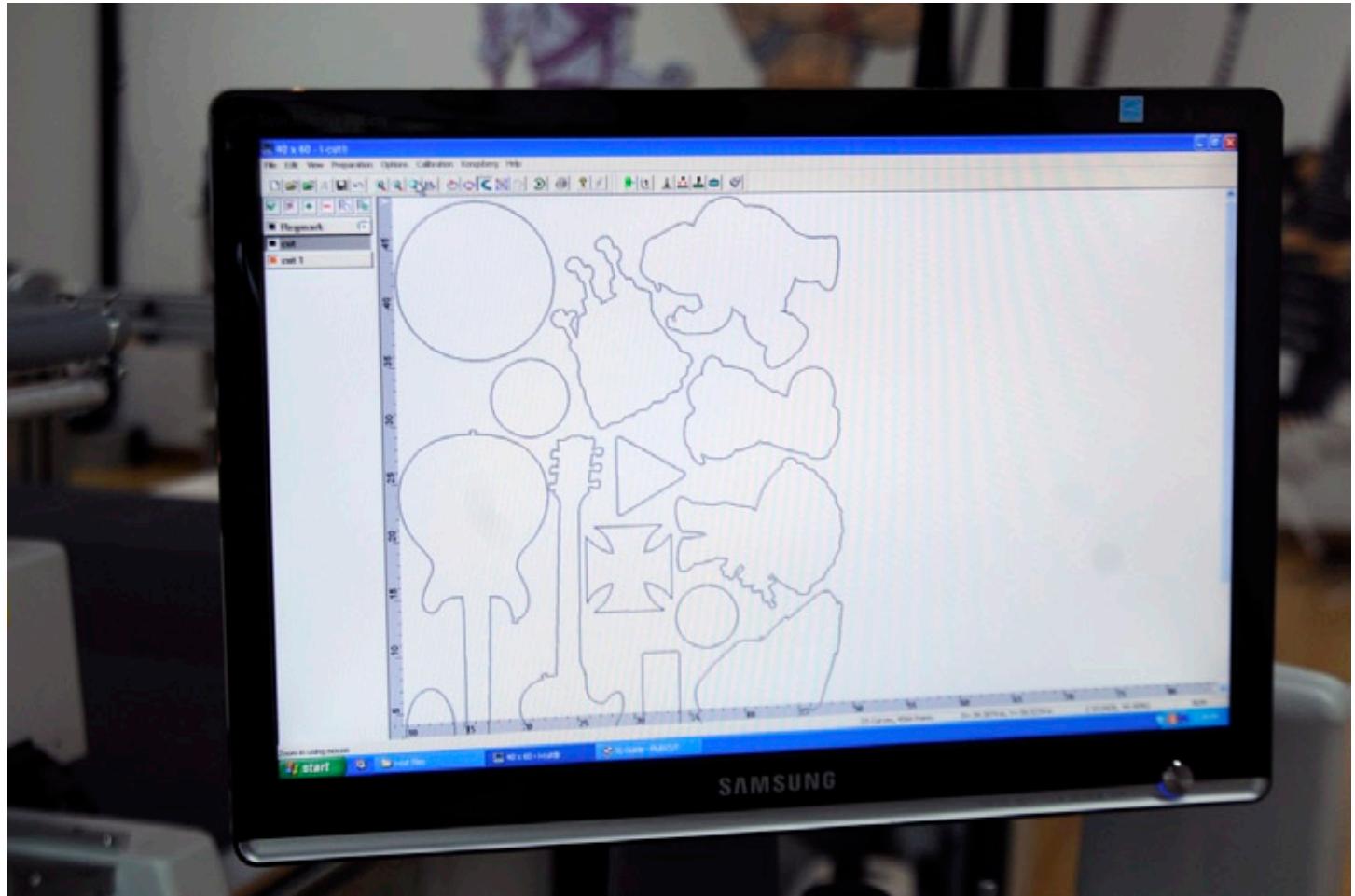
The camera detection, makes an automatic detection of the register marks for accurate cut to print alignment.



CNC cutter machine is used for cut rigid and soft media.  
Kongsberg with MultiCUT option.



CNC router is a machine system for routing thick material.  
RedSail Tech CNC router APPPEXPO Shanghai 2009. There are dozens and dozens of off-shore brands. None yet have an international status. All the recognized brands are made in Europe or USA (Gerber) or Japan (Mimaki). The router sold by Teckwin is made in Canada and rebranded (a rare example of a Chinese company rebranding a North American product).



With the contour nesting you can have the outline (shape) of each component being able to nest close to any appropriate shape to avoid waste of material.



The control station is the place where the operator can handle the machine and oversee the entire job run from a specially designed workstation.

**control station**, place where the operator can handle the machine and oversee the entire job run from a specially designed workstation.

**conveyor belt** is a transport belt, for moving both roll-fed and sheet materials. Some flatbed cutters have a non-moving flat top. Other flatbed cutters have an optional conveyor belt system.

**coroplast**, is a specific brand of corrugated plastic. This brand is a styrene corrugate. There are many other brands; some cheaper brands do not provide a good surface for printing (so your UV-cured ink may fall off after a few days or weeks). And some UV-cured inks do not adhere to corrugated plastic (such as Coroplast) unless you pre-coat the Coroplast with a primer (which slows down your workflow because you have to waste your time coating every sheet by hand).

**crease** is the pressed in indentation or cut of packaging, or a design for a point of purchase display, that is indented (by a creasing tool) so it can be folded or otherwise bent.

**creasing tool**, designed for creasing corrugated, folding carton and plastic materials.

**creasing wheel** means exactly what it says, a wheel that creases the material. Creasing wheels for the Kongsberg KE system come in 15 mm and 26mm diameter.

**contouring**, tool movement along two or more axes at the same time. (CNC Department, TOOLINGU)

**cut**, is a basic meaning of slicing through or into a material, either partially or all the way through. You tend to cut with a knife or other sharp blade.

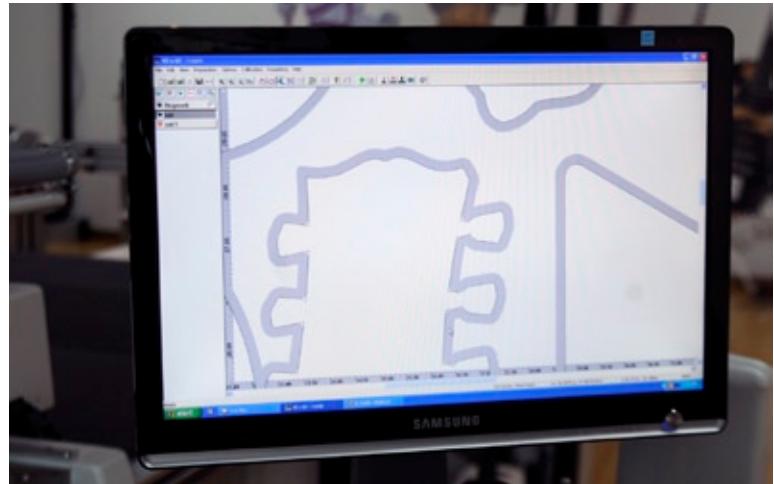
**cut path** is a vector curve created from line segments, arcs, Bezier points etc (i-cut User's Manual).

**cutting surface** is another way to call the "**mat**" on which you cut. The cutter surface or mat is placed on top of the actual table. This way if the tools cut through the material (which they should to some degree!) then you won't permanently damage the actual table. The cutting surface or mat can simply eventually be replaced at low cost. Cutting surfaces for MultiCam would be LDF, perforated polycarbonate sheet, or fiberous belting material.

**cutting panel**, holds the workpiece. (Flat bed cutting ploter CF3-1631 and CF3 16-10 Operation Manual, Mimaki)

**cutting underlay**, see **underlay**; the material under where you cut; material that protects the table top from being cut. You could consider the cutting underlay as a cutting mat.

*Cutting surface is another way to call the material on which you cut.  
Kongsberg i-XL24 MGE site visit.*



*The contour is the curved surface or dimension that is cut into the sign or display you are working*



*In the control station the operator can handle the machine and oversee the entire job run.*



**D**

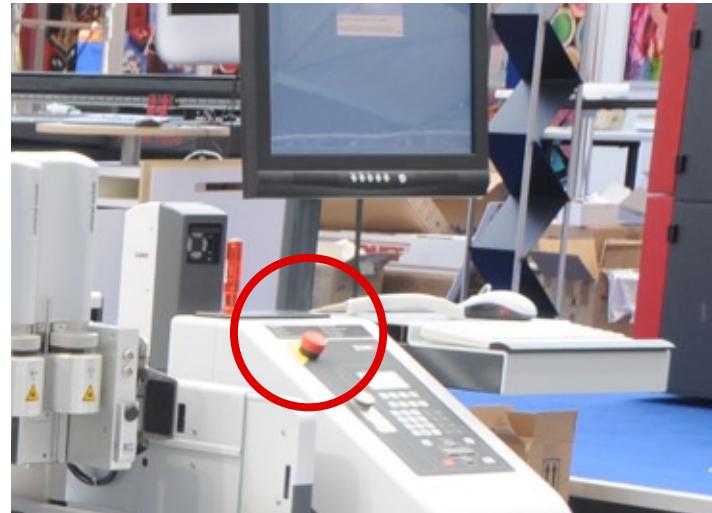
**depth of cut**, the thickness of the material that is removed by one pass of the cutting tool over the workpiece. (CNC Department, Basics of the CNC turning center 120, TOOLINGU)

**Dibond**, polyethylene core with thin aluminum face.

**diecut knife tool(s)** are for soft plastics, hard plastics (*i-cut* list), card stock, chip board, polyester, thin PP (thick PP with router tool).

**digital diecut**, is the process of cutting out a shape with a digital cutter rather than some antiquated method as used in past centuries.

**display**, cut or lightweight POP/POS. )G3 The new generation of Zünd digital cutters, Zünd



*Emergency button switches off all power to the table.*

**distortion**; *i-cut* has patented its manner of recognizing and compensating for distortion to the printed material (whether distortion is caused by heat, cooling, humidity, stretch, compression, or whatever).

**drag knife**, does precisely this, a knife blade that is dragged across the material (MultiCam)

**drill**, is a common household or industrial machining tool used to perforate a material and create a round hole.

**driven rotary tool**, designed for cutting fibrous, porous materials, including fabrics, technical textiles, and composites.

**E**

**emergency stop button**, a red-colored stop button switches off all power to the table.



*Esko Artwork booth, at ISA 2009.*

**EskoArtwork**, is a multi-national multi-talented company that provides hardware, software and consultancy for the packaging and printing industry.

**Esko Graphics**, see **EskoArtwork**.

**extraction system** (chip extraction system), jargon for a vacuum cleaner and the necessary tubing to remove waste material when milling a workpiece.



*Extraction system (chip extraction system), jargon for an industrial-strength vacuum cleaner.*

# F

**fiber**, the slender, thread-like cellulose structures that cohere to form a sheet of paper. (Artpaper, glossary)

**finishing** means the part of the signage or display or comparable workflow where a print is cut, trimmed, contour-cut, top-coated, laminated, etc.

**flexihead**, is one of several kinds of heads that you can have on your tool carriage (which rides the gantry). A FlexiHead is used on Kongsberg cutters for folding carton and corrugated board.

**floor graphics**, laminated adhesive-backed vinyl for floor decals and floor mats. (G3 The new generation of Zünd digital cutters, Zünd)

**foam knife unit**, tool for cutting foam, very much used for protective packaging



*Floor graphic made in laminated adhesive-backed vinyl for floor decals and floor mats.*

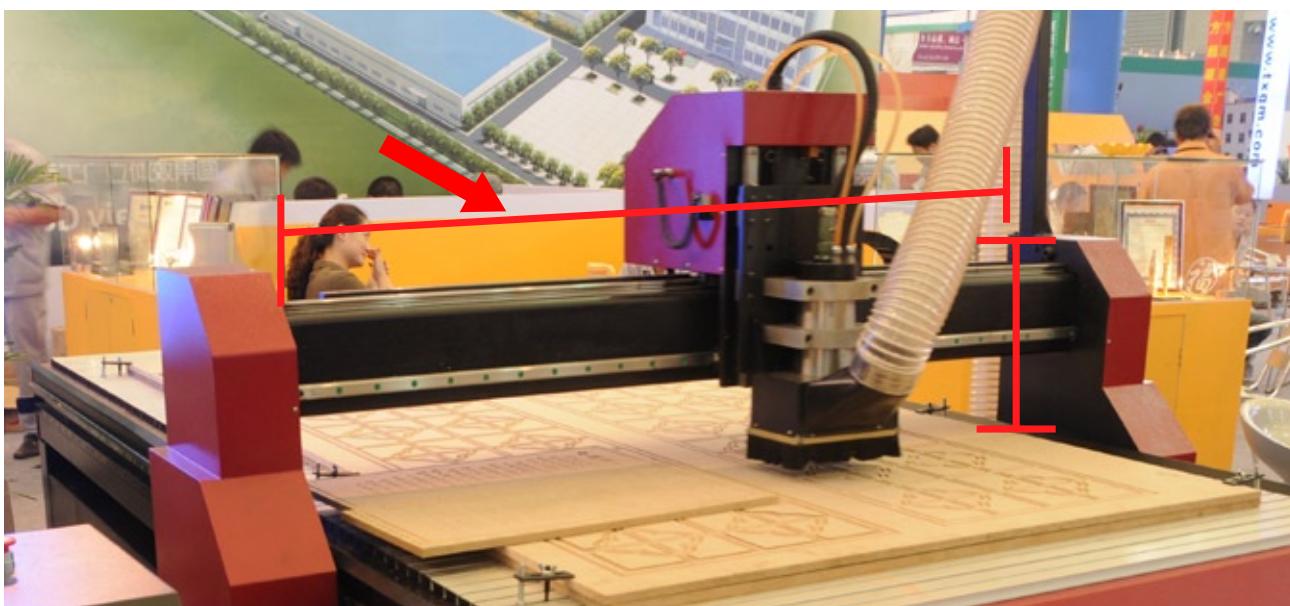
# G

**gantry** is the metal structure that straddles across the Y-axis of a machine and carries the tool system. Flatbed UV-cured inkjet printers also have a similar gantry. The word gantry comes from the support platform that holds the cranes that you see at shipyards and railway yards for loading and unloading shipping containers.

**Gatorfoam**, a brand name of polystyrene foam bonded between two layers of Luxcell wood-fiber veneer.

**Gatorplast**, polystyrene facing with foam center.

**grain**, direction of fibers in a sheet of paper. Long grain describes fibers running parallel to the longest side of a sheet. short grain running parallel to the short side. (Artpaper, glossary)



*Gantry is the metal structure that carries the tool system.*

## H

**HDU**, heavy-duty unit. (Kongsberg XP User Manual)

**head**; is the main component of a tool-carrying carriage. A carriage (which rides along the side of a gantry which crosses the **Y-axis**). A head may have several tool stations. Each manufacturer may use different jargon. This glossary will seek to add discussions of other relevant brands, but since we had the opportunity to be trained at the Kongsberg facility in Lake Geneva, Wisconsin, this first edition starts off with their head nomenclature: FlexiHead (for XL series) has three configurable tool stations + *i-cut* camera and MultiCUT head, with two configurable tool stations + *i-cut* camera + router.

**Head fixing screw**, fix the head to the Y bar. (Flat bed cutting ploter CF3-1631 and CF3 16-10 Operation Manual, Mimaki)

**hydraulic servo**, is a type of servomechanism that is driven by fluids. (CNC Department, Mechanics of CNC 110, TOOLINGU)

**Hi-Force knife** tool (Z2 position, Kongsberg XP).

**HSMU**, high speed milling unit. (Kongsberg XP User Manual)



The head is the main component of a tool-carrying carriage. Mimaki CF3 1631 at Mimaki booth SGIA 2009.



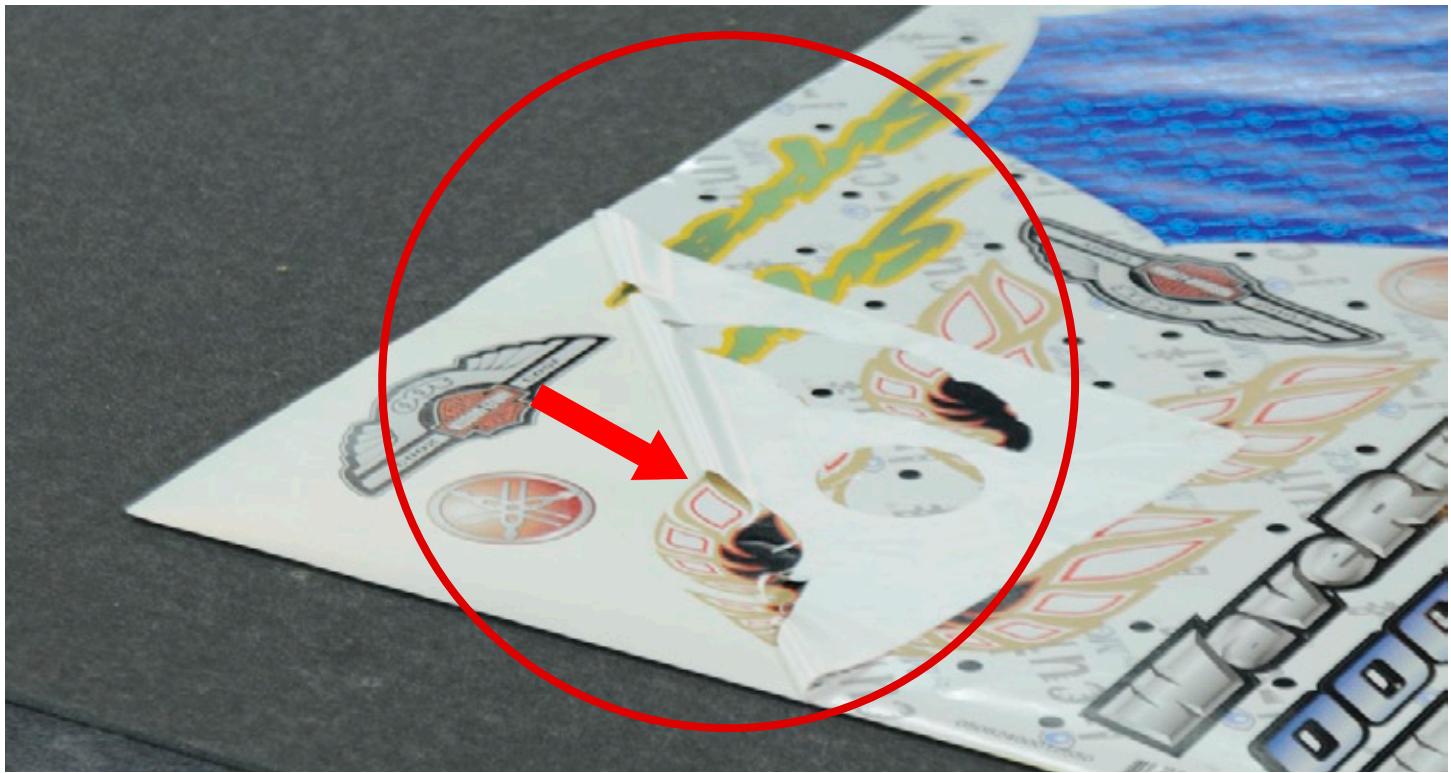
*i-cut* vision system from MGE (Esko).

## J

**job changeover**, the time it takes to switch from one part to another. (CNC Department, History and definition of CNC, TOOLINGU)

## K

**kiss-cut** is a method of cutting through the facestock of label paper or other material, but not through the liner. (Glossary of Terms, Special Substrate Solution)



*Kiss-cut is a method of cutting through the facestock of label paper or other material, but not through the liner.*

## L

**laser** associated with a **flatbed digital XY-cutter** is not a **laser cutter**, but a laser to show where the system is situated directly over the table (or over the material to be cut). However there are flatbed laser cutter systems, see next entry.

**laser cutter** (CO2 laser cutter). Companies such as Universal in the US, Trotec in Austria, GCC in Taiwan make these systems, usually for sizes under one meter in maximum dimension. MultiCam makes laser cutters at larger sizes. Other kinds of flatbed cutters include **plasma cutters** and **water jets**.

**laser pointer** is the correct designation for the laser associated with a flatbed digital XY cutter-router. This pointer points downward (on the material you wish to cut) so you can see where it is hovering over.

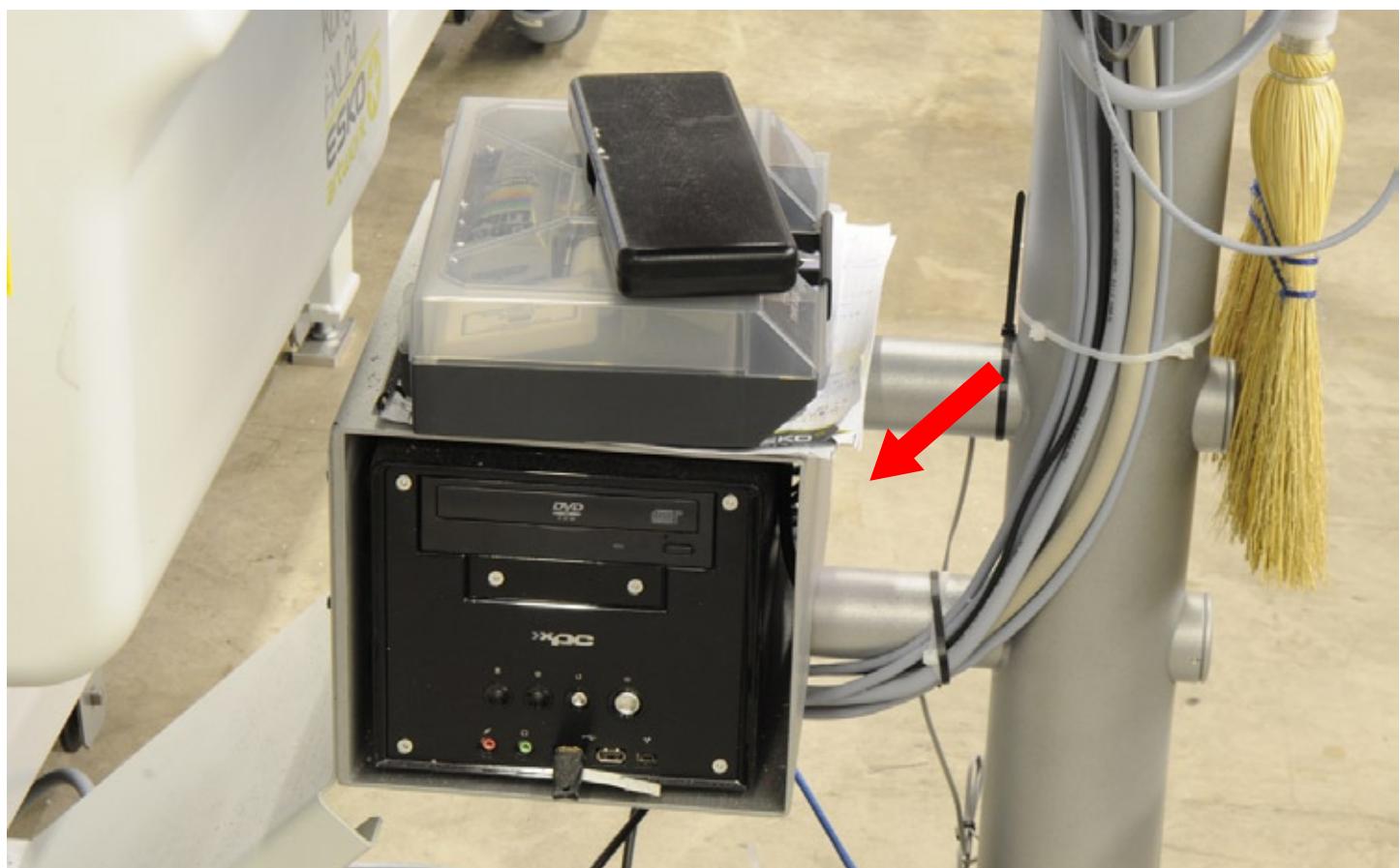
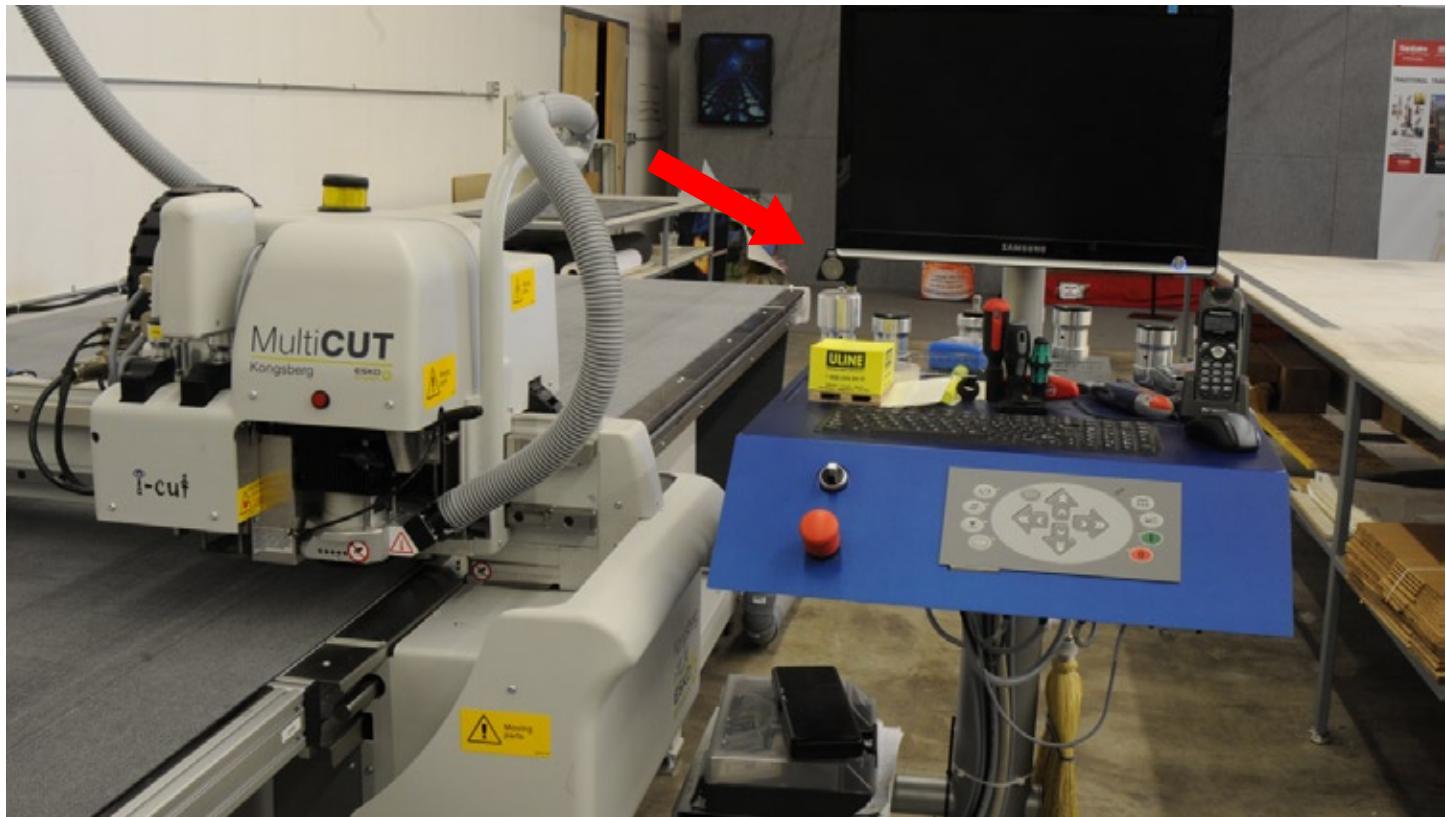
**lenticular**, clear acrylic with 2 way visible lens surface. (*i-cut, Material Reference Key*)

**light pointer**, used for positioning to read register marks and setting the origin position. (Flat bed cutting ploter CF3-1631 and CF3 16-10 Operation Manual, Mimaki)

## M

**machine control unit**, is a small, powerful computer that controls and operates a **CNC** machine. (CNC Department, History and definition of CNC, TOOLINGU)

**marking** (Aristo); a marking tool can include several kinds of pens (Kongsberg XE). May also be called a **pen plotting tool** by other manufacturers (Gerber M).



The machine control unit, is a small, powerful computer that controls and operates a CNC machine.

**mat cutting tool** (PPT in Zund jargon).

**MDF** is Medium Density Fiberboard (HDF is High Density Fiberboard). These materials may be used also for furniture.

**MDO** is Medium Density Overlay, used for construction fences, construction signs.

**measuring station**, calibrates the measuring foot and height of the tool tip. (Kongsberg XP User Manual, p. 101)

**MGE**, Mikkelsen Graphic Engineering, Inc., from the name of Mr Steen B. Mikkelsen, is now part of **Esko Artwork** is the developer of **i-cut vision system**.

**mill**, machining tool used to either horizontally or vertically remove metal from the surface of a workpiece. (CNC Department, TOOLINGU)

**milling** in a digital flatbed system tends to mean the same as **routing**.

**milling mat**, is the protective mat that covers the actual surface of the flatbed table so that if a tool cuts through the material you are working on, this tool will not mark the actual flatbed table surface but instead will only scratch the mat. You can replace the mat easily and at reasonable cost once it is cut too often

**module** is a component of a larger system. The idea of a module is that you can switch one module for another quickly. Older cutting tables were dedicated, not modular. An old-fashioned dedicated system meant that it was time consuming to switch one tool to another. Beware of buying any used flatbed cutting table because you might get stuck with a non-modular system.

**motor**, be sure your system has brushless servo motors. Anything with a stepper motor for **X** or **Y** axis is old-fashioned and not precise enough. Kongsberg has a servo motor on each side of the gantry on their heavy duty XP series.

**multi-point tool**, machining tool that has two or more cutting edges. (CNC Department, Basics of the CNC machining center 130, TOOLINGU)

**multi-pass**, the numbers of times to perform cutting, is set when cutting a work that cannot be cut by performing cutting once. (Flat bed cutting ploter CF2 Serie. T, TF and TD model, Oeration Manual, Mimaki)



Material cutting tools.



The milling mat, is the protective material that covers the actual surface of the flatbed table so that if a tool cuts through the material you are working on, this tool will not mark the flatbed table surface.



The nesting is an application that efficiently match graphic designs with the available substrate.

## N

**nesting**, application to efficiently place as many graphic designs within the smallest possible space in order not to waste material. (Kongsberg XP User Manual). Most professional RIP software products can do basic nesting of images, but these nest the total board size, not the size of the design subtracting the material that you cut away. In order to eliminate the wasted space of the material between the edge of your design and the edge of your rectangular board you need software that can do contour nesting.

## O

**oscillating, pneumatic oscillating knife, electric oscillating tool, oscillating cut vs static**, You would use an oscillating tool on cork, on thick foam core (die cut on thinner foam core), materials for gaskets (neoprene, nylon, Teflon: *i-cut*), corrugated material, card stock, leather, even fabrics and textiles.



Kongsberg calls its sheet feeding system on their XE model the Pick & Place.

## P

**PA**, Polyamide.

**part program**, series of numerical instructions used by a CNC machine to perform the necessary sequence of operations to machine a specific work-piece. (CNC Department, History and definition of CNC, TOOLINGU)

**PC** polycarbonate.

**PE** polyethylene.

**PET** Polyethylene terephthalate.

**pen plotting tool** (Gerber M Series), may be called a **marking tool** by other manufacturers.

**Pick & Place**, is Kongsberg name for their sheet feeding system.

**plasma cutter** is another industrial category (not for signage, so we mention plasma cutting as a term but do not yet cover this technology). Plasma is for cutting steel, titanium, brass, etc. See also **water jets**.

**ply**, a single layer of paper or paper-like material. Ply is a term used when several sheets of paper are laminated together to form a board. (Artpaper, glossary)

**POP**, Point of purchase.

**progress bar**, displays the percentage of the job that has been sent to the plotter. (User Manual, *i-cuts* 6)

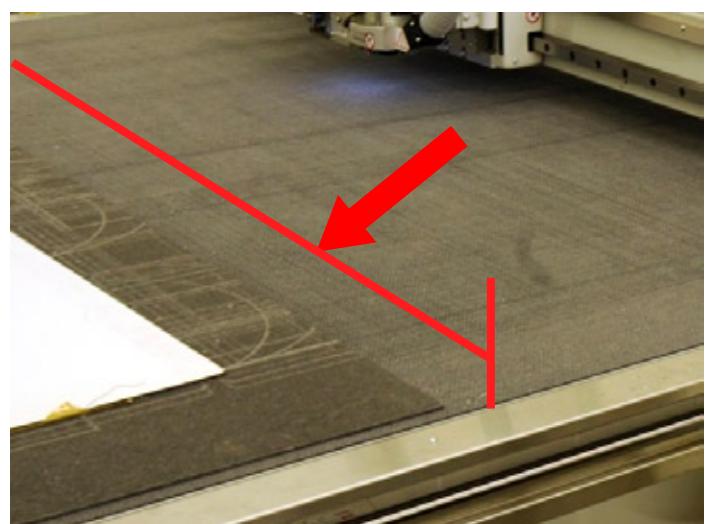
**protective pad**, a **milling mat**, so cutting tools don't damage the transport **belt** or the flatbed table structure below the belt.

**PUR** Polyurethane.

**PVC** Polyvinylchloride.



POP (Point of purchase) marketing material.



A protective pad (a mat) helps insure that cutting tools don't damage the transport belt or the flatbed table structure.

# R

**reaming**, process of using a multi-point tool to smooth the interior surface of a hole. (CNC Department, History and definition of CNC, TOOLINGU)

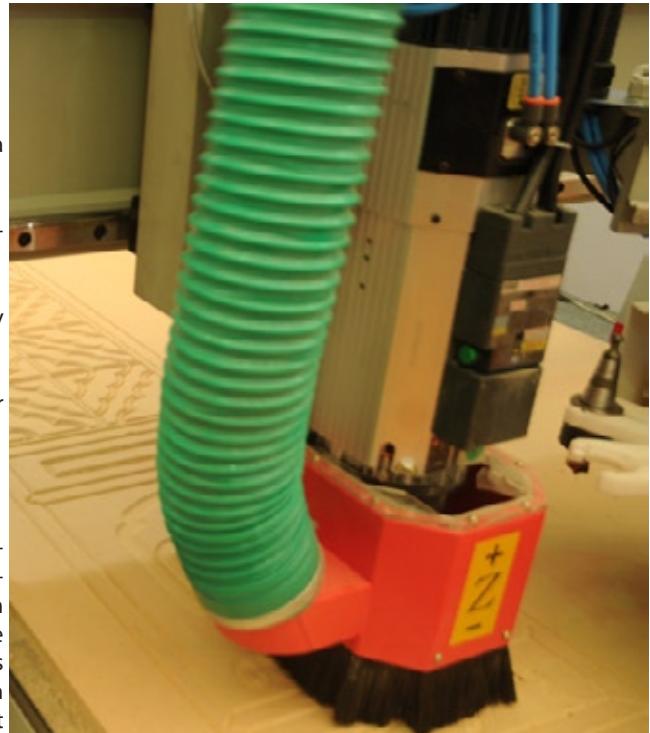
**register bar** is an aid when the material needs registrations that fits the requirements of a specific printing press or die cutter. (Kongsberg XP User Manual)

**registration mark**; marks made or printed on a surface to help with alignment by a **vision system**.

**Register mark sensor**, sensor to detect register mark. (Flat bed cutting ploter CF3-1631 and CF3 16-10 Operation Manual, Mimaki)

**RM knife tool** (Z2 position, Kongsberg XP).

**RIP** software, Raster Image Processor software is what provides brains and intelligence to most wide-format inkjet printers. RIP software is used from an independent outside vendor to coordinate activities of a wide-format printer together with the printer's own software which is called the printer firmware. Some RIP software is well attuned to handling XY cutters; other RIP software, such as from EFI, lacks advanced level coordination with XY cutters (*i-cut instruction manual*, 2007). In other words, when you are deciding what RIP software brand to select, make sure it can handle key aspects of an XY flatbed cutter. The RIP software with which FLAAR has most experience is Caldera.



The subject of this FLAAR Reports glossary is initially more on XY cutters and digital routers.

**rotary knife**, a knife with a 360-degree blade rotating along the cutting movement. Commonly used for cutting textiles.

**router**, cutting machine tool. The dictionary definition would be: A machine with a revolving vertical spindle and cutter for milling out the surface of wood or metal. (Merriam-Webster, online dictionary.)

**routing** may be used for thick flat rigid material: Acrylic, Dibond, Sintra, Styrene, Polycarbonate, composite wood, Gatorplast (initiated from the Kongsberg list of materials; most major brands of flatbed cutters have comparable lists).

**routing head**, neumatic router. (Gerber M Series)



Registration marks help with the media alignment.

# S

**shelf signage**, contour-cut shelf talker for in-store promotions and window displays. (G3 The new generation of Zünd digital cutters, Zünd)

**spear point** (MultiCam).

**speed**; there are so many aspects to speed, and so many different makes and models, that we do not yet attempt to list every speed. But to show comparative differences here are some basic figures (they are rounded off to make comparison more easily; the actual specs are in the respective spec sheets):

- Kongsberg XE series is about 3000 linear inches per minute;
- XL series is 2000 per minute;
- XP is about 4000 linear inches per minute.

**servomotor**, a motor used in CNC machines that turns the ballscrew to move parts with precision. ( Basics of the CNC Turning Center)

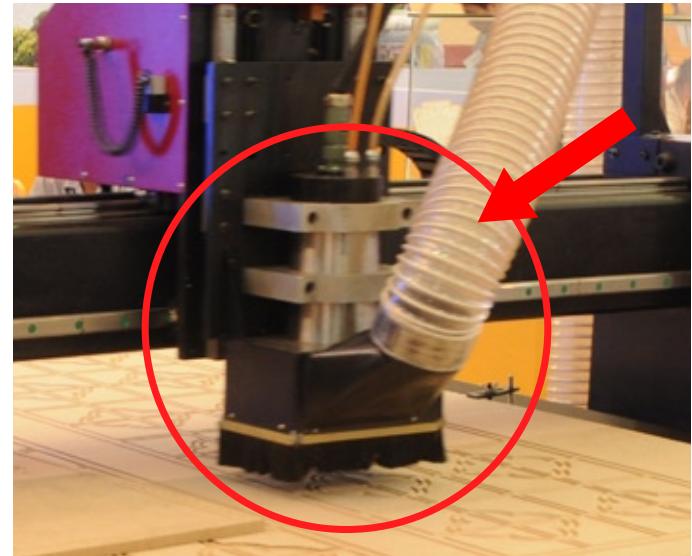
**spring (loaded) knife** (for vinyl and flexible materials, Gerber M Series).

**static vs oscillating**; a static knife tool means it does not oscillate; a static knife tool is to cut through thin rigid material such as carton board and PP (polypropylene). If you need to cut thicker or harder material, then you need a HiForce Knife Tool.

**station**, see **tool station**.

**suction hose** is the area around the tool; a circular brush forms the "wall" of the suction house. In other words, the tool is completely surrounded by a brush that keeps (most) chips and splinters and dust from escaping onto the table, into the air, and hopefully away from your eye. But, remember, you should be wearing protective work area glasses anyway.

**Sward knife** (Gerber M Series).



*Suda CNC router suction hose, APPPEXPO, Shanghai 2009.*



*Kongsberg i-XL24 tool station*

# T

**tangential knife** a knife tool where the direction of the tools is servo controlled to always be in the direction of the cutpath. Opposed to a drag knife which is dragged without any direction control.

**textiles**: The cutters that FLAAR is evaluating presently are for signage, display, and packaging. But today soft signage is increasingly used. Soft signage means printing on textiles, especially polyester. And every year more inkjet printers are outfitted for printing on textiles for décor and clothing samples. So if you have occasional need to cut polyester, cotton, mesh, etc, for a print shop, then you can adapt a Kongsberg cutter to handle cloth.

But if you are a textile production company, then you would be looking at a textile cutter (Gerber would be one example), not a signage or materials cutter

**three-axis curvature data**, information that describes the motion and posi-



*An example of the ability of a Kongsberg cutter to cut textile material.*

tion of an object using three-dimensional data. (CNC Department, History and definition of CNC, TOOLINGU)

**through cutting** (cutting all the way through) is contrasted with **kiss cutting** (Kongsberg XE).

**tool**, an instrument for working, in our case, cutting or shaping materials.

**tool bar** is jargon for the row of column of command areas on the software operating graphical user interface. So tool bar has nothing to do with cutting tools.

**tool force**, cutting forces include the rotational forces in drilling or grinding.

**tool head** uses for cutting and creasing of a wide spectrum of designs and materials. (The Esko Kongsberg Digital Converting, Short-run production of packaging and POP displays)

**tool recognition** means the system can either read the bar code or otherwise recognize what tool is presently installed.

**tool station** is the location and the unit where tools can be utilized. The Kongsberg XL offers.

**traverse**, listed as such in the Kongsberg manual. I would suggest calling this the front of the gantry where the Y carriage goes back and forth.

## U

**underlay**, meaning **cutting underlay**, the material or cutting mat that is below where you cut. For the Gerber M Series the cutting underlay can be High Friction PVC, Texon, or felt.

**universal cutting tool**, for through-cutting materials up to a thickness of approx. 3 mm / 1/8". (Zund, Download PDF's)

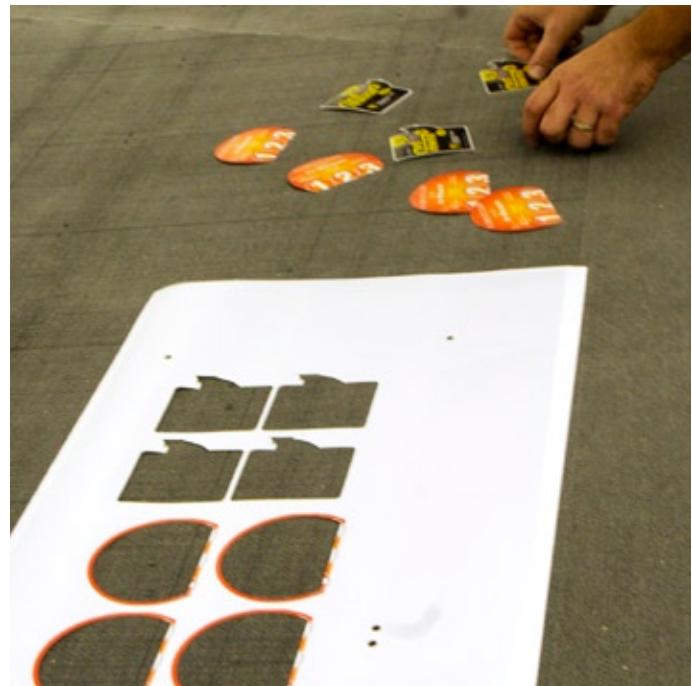
## V

**vacuum table** suction for firm and dependable material hold-down.

**vector** a mathematical quantity that has both a magnitude and direction . (Merriam-Webster, online dictionary).

**VibraCut knife** tool (Z2 position, Kongsberg XP).

**vision system**; is used to allow the cutting tool to find where to cut by means of round black dots that are printed around the item that is to be cut out. i-cut would be one vision system. i-cut is from MGE, now owned by Esko Artwork.



*Through cutting is the method of cutting the facestock of label paper or other material and through the liner.*



*Universal cutting tool cut up a thickness of approx. 3 mm.*

## W

**waterjet cutting** can also be employed on a flatbed cutter platform. MultiCam lists their waterjet cutters for glass, ceramics, fiberglas, granit, marble and other applications.

**wheel or wheel tool**, see **creasing wheel**.

**workpiece**, the part that is being machined. (CNC Department, Basics of the CNC turning center 120, TOOLINGU)

**work table**, is the flat work space, the flatbed table that supports your cutting or other activity.

## X

**x-axis**, is the axis forward and back from one end of the table to the other (side to side is the **Y-axis**).

**XY**, X-axis and Y-axis.



*The x-axis represents motions and positions both toward and away from the operator.*

## Y

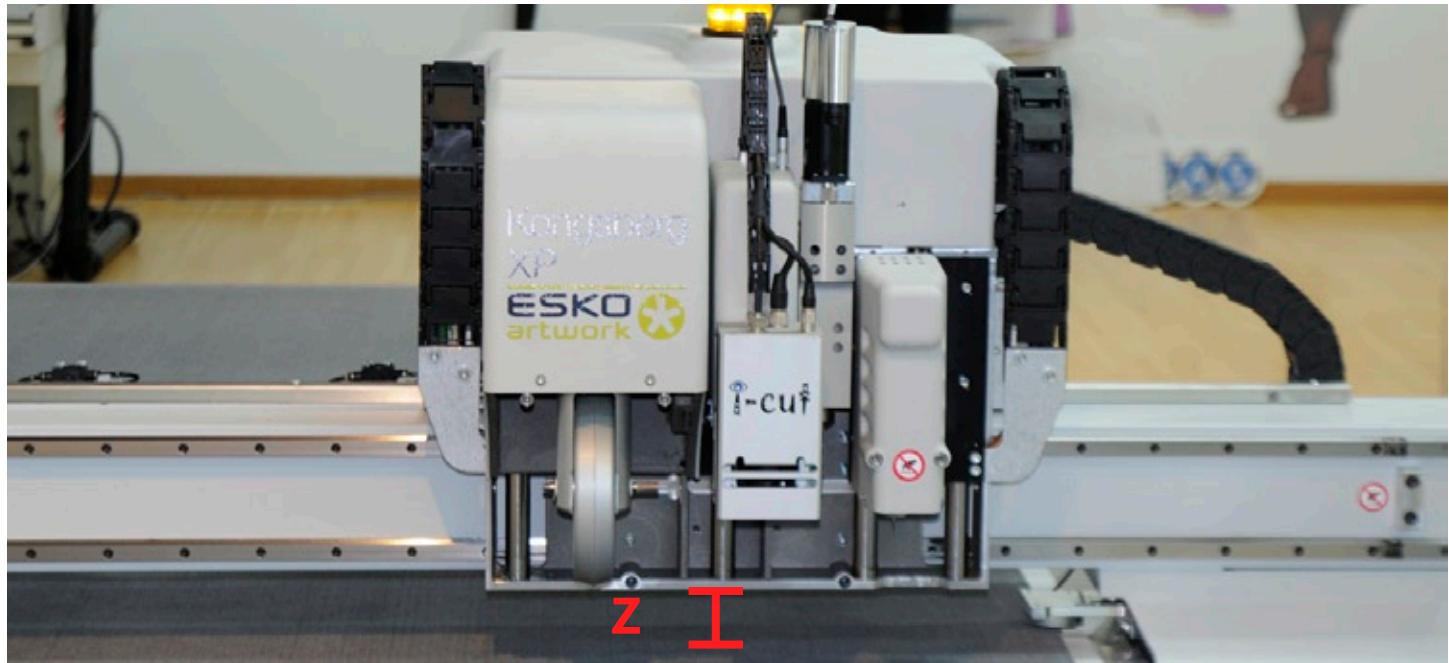
**y-axis**, is the left and right linear movement along the gantry (the tool carriage moving either left or right).



*The y-axis represents motions and positions to the left or right of the operator.*

## Z

**z-axis** is the up and down direction.



*The z-axis represents motions and positions both up and down direction.*

**End note:**

This glossary includes words from Gerber, Kongsberg, MultiCam, and Zünd cutting systems. Mimaki literature is based on a Japanese original, so some of the terms used in English versions of Mimaki spec sheets are a bit literal. As a result the terms used in Mimaki cutting products are not included since the present glossary is for actual English terms, not literal translations that are not the typical words used in English-speaking printshop environments.

**Postscript****This glossary would have come out two years ago, but funding was not available.**

Usually you can find a glossary already on the Internet somewhere. Half the terms are common sense or common knowledge anyway. But having been a professor in my earlier life I prefer to create the glossary myself, from scratch (besides, I could not find any glossary of flatbed digital XY cutter-routers). Surely there are plenty of glossaries of old-fashioned machining tools and CNC routers (one would be CNC Department, Basics of the CNC turning center 120, TOOLINGU), but the FLAAR Reports are specific to digital cutters. And during the weeks that this glossary was under formation we did not yet find any glossary for flatbed cutters.

During the years 2004-2007 I saw flatbed cutters at many sign printing companies. Some were Zünd; others were Kongsberg. Then in 2007 Zünd flew two of us from FLAAR to study their UV-cured printer at their Swiss factory, the model 250. The research documented that this printer had many features of remarkable technology. Unfortunately the manufacturing cost in Switzerland was too expensive and Zünd correctly realized they could make more profit by concentrating on their cutters than attempting to compete with 45 other manufacturers making UV-cured printers. So their UV printer staff formed a separate company a few kilometers away and now sell newer model UV printers under a non-Zünd brand name; however the model 250 was never resurrected, for reasons listed below.

Unfortunately the Zünd model 250 printer was a hybrid, not a combo (a hybrid means a printer has pinch rollers and not a transport belt. Zünd opted for abandoning a conveyor belt printing transport system because it is not easy to make the transport belts function flawlessly on their original model 215). Regrettably all hybrid style UV-cured printers, even with two widely spaced parallel bars of pinch+grit rollers, is not deemed adequate for the full range of materials that are printed today. Presently, in 2009, a UV-cured printer transport system needs to be able to handle scores of materials that were not used for printing in 2004 when the Zünd 250 was conceived. So although the technology of the model 250 was impressive in itself, it is the wrong technology for the year 2009 onward (in addition to being too expensive). Not one single solitary pinch-roller flatbed hybrid has been successful if it costs over \$70,000 (the model 250 cost almost 400% more than that).

Once the Zünd printer project was abandoned by Zünd management, I thought it would be useful to switch over to the evaluation and review of their XY cutters. Their US distributor was encouraging, so FLAAR started this but Zünd in Switzerland decided not to continue with any project funding of evaluation of XY cutters, so already in 2008 there was no more money for initiating a glossary and other FLAAR Reports on XY cutter applications. But in 2009 funding became available from Kongsberg to continue with our glossary project, so the present glossary was prepared to be launched at SGIA 2009 in October, in New Orleans.

So, this glossary would have been issued two years ago, but at least I did not give up, and here it is today in 2009, with fresh new photographs. If the glossary had been issued in 2007-2008 it would have featured other earlier models. So in retrospect one advantage of waiting for funding is that now this glossary can have current year 2009 models as examples.

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Mimaki Engeineering Co. Ltd.

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Mimaki Engeineering Co. Ltd.

Flat bed cutting plotter CF2 Serie. RC and RT model, Oeration Manual, Mimaki.

Mimaki Engeineering Co. Ltd.

[www.gspinc.com/default.asp?contentID=282](http://www.gspinc.com/default.asp?contentID=282)

Information on Gerber M Series cutters, including links for downloads of user manuals.

[www.labelexperts.com/general/dpage.asp?sec=11](http://www.labelexperts.com/general/dpage.asp?sec=11)

Glossary of Terms, Special Substrate Solution.

[www.icuttools.com/order/downloads.php](http://www.icuttools.com/order/downloads.php)

i-cuts, Material Reference and Price sheets.

[www.icuttools.com/order/download/pricesheets/icut-router.pdf](http://www.icuttools.com/order/download/pricesheets/icut-router.pdf)

*i*-cut, Material Reference Key.

[www.icutvision.com/help\\_English.pdf](http://www.icutvision.com/help_English.pdf)

User Manual, *i*-cuts 6.

[www.adcom.bg/Web/esko/dcm/Kongsberg\\_DCM\\_US.pdf](http://www.adcom.bg/Web/esko/dcm/Kongsberg_DCM_US.pdf)

The Esko Kongsberg Digital Converting, Short-run production of packaging and POP displays.

[www.zund.com/index.asp?site=8&topic\\_id=1721&m=1721](http://www.zund.com/index.asp?site=8&topic_id=1721&m=1721)

Zünd, Download for PDF's

[www.adcom.bg/Web/esko/xe/kongsbergxe10\\_us.pdf](http://www.adcom.bg/Web/esko/xe/kongsbergxe10_us.pdf)

The Kongsberg XE10, Dieless digital cutting and creasing tables for folding carton packaging.

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[www.dictionary.cambridge.org](http://www.dictionary.cambridge.org)

Cambridge, online dictionary

[www.artpaper.com/mm5/merchant.mvc?Screen=GLOSSARY](http://www.artpaper.com/mm5/merchant.mvc?Screen=GLOSSARY)

Artpaper, glossary.

## Appendix A

### Research that went into preparation of this glossary

I have spent two days in the Zünd factory two years ago with one of the Technical Writers from FLAAR (Eduardo Sacayon, who is tri-lingual including Deutsch; FLAAR itself is tri-lingual Deutsch, Español, English). I have also visited several printshops who have Zünd cutters, including one in Europe who made a good point: that they could cut foamcor okay but with other materials the owner of the printshop felt that the cutters' heritage in cutting textiles and other soft materials showed through. Since FLAAR is primarily interested in architectural materials, which implies a really strong cutter, we next went to visit the MultiCam factory in Dallas. But again, we inspected a printshop (where a former student of ours was a manager) and by coincidence they had an older MultiCam CNC router with a digital cutter tacked on later. The printshop manager felt it was not satisfactory as an XY digital cutter for signage material. So we had two sign shops, each with slight dissatisfaction. I will state clearly that both these models were designed and manufactured probably four or so years ago; both companies, Zünd and MultiCam, now have newer systems and I am sure if the two printshops got rid of their old models and acquired newer models they would be more content.

But FLAAR does not buy or sell cutters, so next we went to another printshop that had a newer model of cutter: a Kongsberg i-XL system. This Kongsberg really cut through thick heavy material, in fact I could barely lift the board it had cut (and this was only the remaining frame, after all the figures had already been cut out).

I would add that not one of these brands of cutters was sought out specifically by brand. In other words, no cutter company told us to go out and search for cutters. FLAAR was inspecting UV-cured printers, and it was entirely coincidental that the same printshops happened to have a Zund, a MultiCam, and a Kongsberg cutter. Thus it was coincidental what model they had, and equally coincidental that the older models were not as good at cutting as the dedicated Kongsberg.

We are considering visiting a printshop that owns a Gerber ionX UV-cured flatbed printer, who also purchased a Gerber Series M cutter. They already wrote to tell us they like the printer better than another brand they bought last year; their cutter is being installed this month (September) and after they have experience, we will seek a grant to visit them.

In the meantime, there are Kongsberg cutters near the FLAAR office: the installation in Bloomington, Illinois (that we have visited twice), two installations in Kansas City and one in St Louis itself. Since I am writing this introduction in Paris (France, while at VISCOM Paris, en route to a trade show in Kiev, Ukraine), I am a bit far away from the installations in Missouri.

**First issued November 2009.**

### Reality Check

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

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

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Starting in 2008, updates on UV-curable wide-format inkjet printers are available for all individuals and companies which have a subscription, or to companies who are research project sponsors. If you are a Subscriber or manager in a company that is a research sponsor, you can obtain the next update by writing [ReaderService@FLAAR.org](mailto:ReaderService@FLAAR.org). If you are neither a Subscriber or a research sponsor, simply order the newest version via the e-commerce system on [www.wide-format-printers.NET](http://www.wide-format-printers.NET). Please realize that because we have so many publications and many are updated so frequently that we have no realistic way to notify any reader of when just one particular report is actually updated.

There is a free PDF that describes the UV-curable inkjet printer Subscription system. Subscriptions are available only for UV-related wide-format printer publications.

FLAAR Reports on UV-curable roll-to-roll, flatbed, hybrid, and combo printers are updated when new information is available. We tend to update the reports on new printers, on printers that readers ask about the most, and on printers where access is facilitated (such as factory visits, demo-room visits, etc.).

Reports on obsolete printers, discontinued printers, or printers that not

enough people ask about, tend not to be updated.

FLAAR still publishes individual reports on solvent printers, and on giclee printers, but subscriptions on these are not yet available; these FLAAR Reports on solvent, eco-solvent, and water-based wide format printers have to be purchased one by one.

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

#### Legal notice

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

#### Advisory

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

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

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

Or the product may indeed have a glitch but one that is so benign for us, or maybe we have long ago gotten used to it and have a 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 uni-directional, which may be twice as slow as bi-directional.

Trade show examples tend to be on the absolutely best media. When you attempt to save money and use economy media you will quickly notice that you do not get anywhere near the same results as you saw in the manufacturer's trade show booth, or pictured in their glossy advertisement. Five years ago we noticed Epson was laminating prints to show glossy output because their pigmented inks could not print on actual glossy media. The same equipment, inks, media, and software may not work as well in your facility as we, or you, see it at a trade show. All the more reason to test before you buy; and keep testing before you make your final payment. Your ultimate protection is to use a gold American Express credit card so you can have leverage when you ask for your money back if the product fails.

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

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

#### **Factors influencing output**

Heat, humidity, static, dust, experience level of your workers (whether they are new or have prior years experience): these are all factors that will differ in your place of business as compared with test results or demo room results.

Actually you may have people with even more experience than we do, since we deliberately use students to approximate newbies. FLAAR is devoted to assisting newcomers learn about digital imaging hardware and software. This is why Nicholas Hellmuth is considered the "Johnny Appleseed" of wide format inkjet printers.

Therefore this report does not warranty any product for any quality, performance or fitness for any specific task, since we do not know the situation in which you intend to use the hardware or software. Nor is there any warranty or guarantee that the output of these products will produce salable goods, since we do not know what kind of ink or media you intend to use, nor the needs of your clients. A further reason that no one can realistically speak for all aspects of any one hardware or software is that each of these products may require additional hardware or software to reach its full potential.

For example, you will most likely need a color management system which implies color measurement tools and software. To handle ICC color profiles, you may need ICC color profile generation software and a spectrophotometer since often the stock pre-packaged ICC color profiles which come with the ink, media, printers and/or RIPs may not work in your situation. Not all RIPs handle color management equally, or may work better for some printer-ink-media combinations than for others.

Be aware that some RIPs can only accept ICC color profiles: you quickly find out the hard way that you can't tweak these profiles nor generate new ones. So be sure to get a RIP which can handle all aspects of color management. Many RIPs come in different levels. You may buy one level and be disappointed that the RIP won't do everything. That's because those features you may be lacking are available only in the next level higher of that RIP, often at considerable extra cost. Same thing in the progression of Chevy through Pontiac to Cadillac, or the new Suburbans. A Chevy Suburban simply does not have all the bells and whistles of the Cadillac Escalade version of this SUV.

Don't blame us... besides, that's why we are warning you. This is why we have a Survey Form, so we can learn when you find products that are inadequate. We let the manufacturers know when end users complain about their products so that the manufacturers can resolve the situation when they next redesign the system.

Most newer printer models tend to overcome deficiencies of earlier models. It is possible that our comparative comments point out a glitch in a particular printer that has been taken care of through an improvement

in firmware or even an entirely new printer model. So if we point out a deficiency in a particular printer brand, the model you may buy may not exhibit this headache, or your kind of printing may not trigger the problem. Or you may find a work-around.

Just remember that every machine has quirks, even the ones we like. It is possible that the particular kind of images, resolution, inks, media, or other factors in your facility are sufficiently different than in ours that a printer which works just fine for us may be totally unsatisfactory for you and your clients. However it may be that the specific kind of printing you need to do may never occasion that shortcoming. Or, it may be that your printer was manufactured on a Monday and has defects that are atypical, show up more in the kind of media you use which we may not use as often or at all during our evaluations. Equally possibly a printer that was a disaster for someone else may work flawlessly for you and be a real money maker for your company.

So if we inspect a printer in a printshop (a site-visit case study), and that owner/operator is content with their printer and we mention this; don't expect that you will automatically get the same results in your own printshop.

In some cases a product may work better on a Macintosh than on a PC. RIP software may function well with one operating system yet have bugs and crash on the same platform but with a different operating system. Thus be sure to test a printer under your own specific work conditions before you buy.

And if a printer, RIP, media, or ink does not function, return it with no ands, ifs or buts. Your best defense is to show an advertising claim that the printer simply can't achieve. Such advertising claims are in violation of federal regulations, and the printer companies know they are liable for misleading the public.

But before you make a federal case, just be sure that many of the issues are not user error or unfamiliarity. It may be that training or an additional accessory can make the printer do what you need it to accomplish. Of course if the printer ads did not warn you that you had to purchase the additional pricey accessory, that is a whole other issue. Our reviews do not cover accessories since they are endless, as is the range of training, or lack thereof, among users.

The major causes of printer breakdown and failure is lack of maintenance, poor maintenance, spotty maintenance, or trying to jerry-rig some part of the printer. The equally common cause of printer breakdown is improper use, generally due from lack of training or experience. Another factor is whether you utilize your printer all day every day. Most solvent and UV printers work best if used frequently. If you are not going to use your printer for two or three days, you have to put flush into the system and prepare it for hibernation (even if for only four or five days). Then you have to flush the ink system all over again.

Also realize that the surface of inkjet prints are fragile and generally require lamination to survive much usage. Lamination comes in many kinds, and it is worth finding a reliable lamination company and receiving training on their products.

Also realize that no hybrid or combo UV printer can feed all kinds of rigid materials precisely. Some materials feed well; others feed poorly; others will skew.

Although we have found several makes and models to work very well in our facilities, how well they work in your facilities may also depend on your local dealer. Some dealers are excellent; others just sell you a box

and can't provide much service after the sale. Indeed some low-bid internet sales sources may have no technical backup whatsoever. If you pay low-bid price, you can't realistically expect special maintenance services or tech support later on from any other dealer (they will tell you to return to where you paid for the product). This is why we make an effort to find out which dealers are recommendable. Obviously there are many other dealers who are also good, but we do not always know them. To protect yourself further, always pay with a level of credit card which allows you to refuse payment if you have end up with a lemon. A Gold American Express card allows you to refuse payment even months after the sale. This card may also extend your warranty agreement in some cases (check first).

Most of the readers of the FLAAR Reports look to see what printers we use in our own facilities. Readers realize that we will have selected the printers that we like based on years of experience and research. Indeed we have met people at trade shows who told us they use the FLAAR web site reports as the shopping list for their corporate purchases.

Yes, it is rather self-evident that we would never ask a manufacturer to send a product which we knew in advance from our studies was no good. But there are a few other printers which are great but we simply do not have them in our facilities yet.

So if a printer is not made available by its manufacturer, then there is no way we can afford to have all these makes and models in our facility. Thus to learn about models which we do not feature, be sure to ask around in other print shops, with IT people in other corporations, at your local university or community college. Go to trade shows...but don't use only the booth...ask questions of people in the elevator, in line at the restaurant, anywhere to escape the smothering hype you get in the booth.

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

facturer is X-thousand kilometers or miles away, the wait may be many days, or weeks.

#### Lack of Tech Support Personnel is increasing

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

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

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

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

#### Counterfeit parts are a problem with many printers made in China

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

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

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

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

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

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

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

#### Be sure to check all FLAAR resources

Please realize that with over 200 different FLAAR Reports on UV printers, you need to be sure to check the more obscure ones too. If a printer has a printhead issue, the nitty gritty of this may be in the FLAAR Report on printheads. The report on the model is a general introduction; if we discussed the intimate details of printheads then some readers might fall

asleep. And obviously do not limit yourself to the free reports. The technical details may be in the reports that have a price to them. Our readers have said they prefer to have the general basics, and to park the real technical material in other reports that people can buy if they really want that level of information.

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

#### Acknowledgements

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

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

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

Besides, it does not take any money to see which printers and RIPs function as advertised and which don't. We saw one hyped printer grind to a halt, malfunction, or otherwise publicly display its incapabilities at several trade shows in a row. At each of those same trade shows another brand had over 30 of their printers in booths in virtually every hall, each one producing museum quality exhibits. Not our fault when we report what we see over and over and over again. One of our readers wrote us recently, "Nicholas, last month you recommended the ..... as one of several possible printers for our needs; we bought this. It was the best capital expenditure we have made in the last several years. Just wanted to tell you how much we appreciate your evaluations...."

FLAAR is a non-profit educational and research organization dedicated for over 36 years to professional photography in the arts, tropical flora and fauna, architectural history, and landscape panorama photography.

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

The FLAAR web sites began initially as the report on the results of these studies of scanners. Once we had the digital images we began to experiment with digital printers. People began to comment that our reports were unique and very helpful. So by 1999 we had entire sections on large format printers.

FLAAR has existed since 1969, long before inkjet printers existed. Indeed we were writing about digital imaging before HP even had a color ink-

jet system available. In 2000 FLAAR received an educational grant from Hewlett-Packard large format division, Barcelona, Spain, for training, for equipment, and to improve the design and navigation on the main web sites of the FLAAR Network. This grant ran its natural course, and like all grants, reached its finishing point, in this case late 2005.

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

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

Since 2006 we do a major part of our evaluations at a factory and headquarters demo room. Since the university does not fund any of these trips, it is traditional for the manufacturer to fund a research sponsorship. In the US this is how most university projects are initiated for decades now, and it is increasing. In fact there is a university in Austria that is not an "edu" but is a "GmbH", funded by the chamber of commerce of that part of Austria. In other words, a university as an educational institution, but functioning in the real world as an actual business. This is a sensible model, especially when FLAAR staff need to be on the road over a quarter of a million miles per year (roughly over 400,000 km per year total for the staff). Obviously this travel is hosted since unless money falls from heaven there most realistic way to obtain funding to get to the demo rooms for training is direct from the source.

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

Barbieri electronic (color management), Caldera (RIP), ColorSpan, DEC, Durst, EskoArtwork, Gerber, Grapo, IP&I, Mimaki USA, Mutoh, Dilli, GCC, NUR, Oce, Shiraz (RIP), Sky AirShip, Sun, Teckwin, VUTEk, WP Digital, Xerox, Yuhan-Kimberly, Zund have each brought FLAAR staff to their headquarters and printer factories. Bordeaux, InkWin and Sunflower ink have

brought us to inspect their ink manufacturing facilities and demo rooms. We have visited the world headquarters and demo rooms of HP in Barcelona and received informative and helpful technology briefings roughly every two years. We are under NDA as to the subjects discussed but it is important that we be open where we have visited. Mimaki Europe has had FLAAR as their guest in Europe to introduce their flatbed UV printer, as have other UV-curable manufacturers, again, under NDA as to the details since often we are present at meetings where unreleased products are discussed. Xaar has hosted an informative visit to their world headquarters in the UK. You don't get this level of access from a trade magazine writer, and I can assure you, we are provided much more detailed information and documentation in our visits than would be provided to a magazine author or editor. Companies have learned that it's a lot better to let us know up front and in advance the issues and glitches with their printers, since they now know we will find out sooner or later on our own. They actually tell us they realize we will find out on our own anyway.

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

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

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

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

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

Sometimes we hear horror stories about a printer. The only way we can

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

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

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

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

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

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

Grant funding, sponsorship, demonstration equipment, and training are supplied from all sides of the spectrum of printer equipment and software engineering companies. Thus, there is no incentive to favor one faction over another. We receive support from three manufacturers of thermal printheads (Canon, ColorSpan and HP) and also have multiple printers from three manufacturers of piezo printers (Epson, Seiko, Mutoh, and Mimaki). This is because piezo has definite advantage for some applications; thermal printheads have advantages in different applications. Our reviews have universal appeal precisely because we feature all competing printhead technologies. Every printer, RIPs, inks, or media we have reviewed have good points in addition to weaknesses. Both X-Rite and competitor GretagMacbeth provided spectrophotometers. Again, when all sides assist this program there is no incentive to favor one by trashing

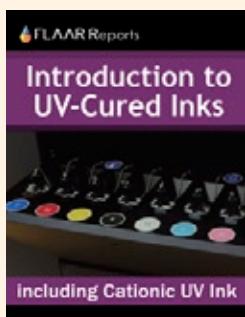
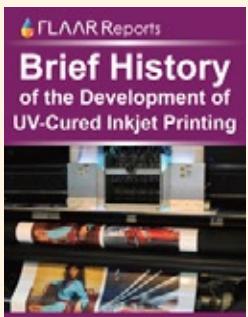
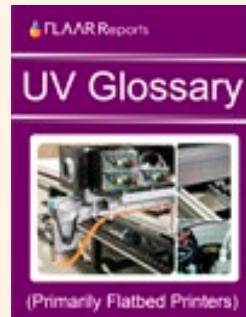
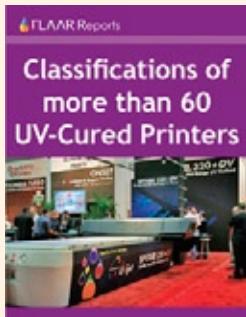
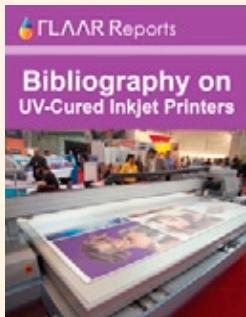
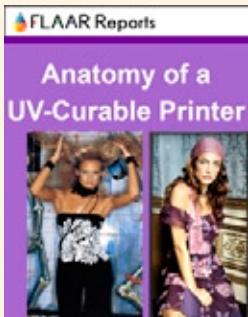
the other. Printer manufacturer ad campaigns are their own worst enemy. If a printer did not make false and misleading claims, then we would have nothing to fill our reviews with refuting the utter nonsense that is foisted on the buying public.

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

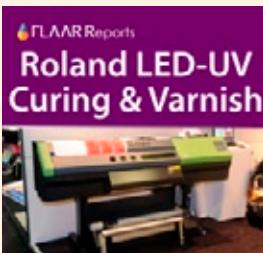
These are some of the most  
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Introduction to UV Curable Inkjet Flatbed Printers



Most recent UV Printers



Gandinnovations Jeti 3348 UV JetSpeed

VersaUV Print&Cut LEC-300

LED Curing Mimaki UJV-160

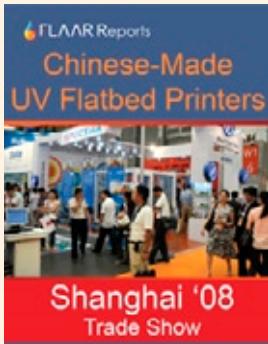
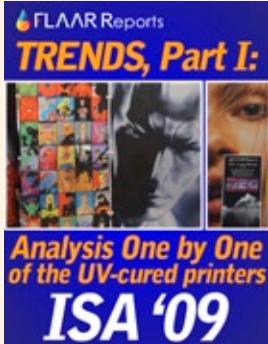
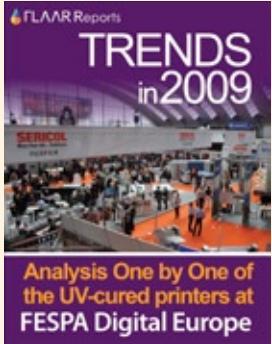
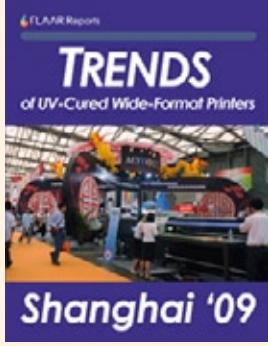
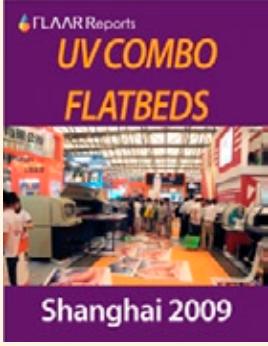
Formerly NUR Tempo UV Flatbed

Teckwin TeckStorm

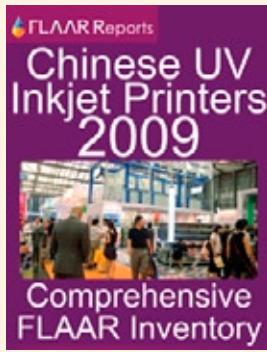
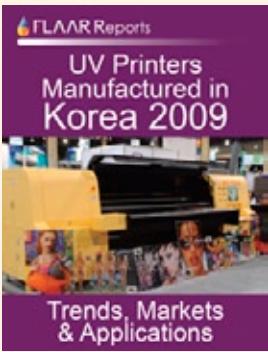
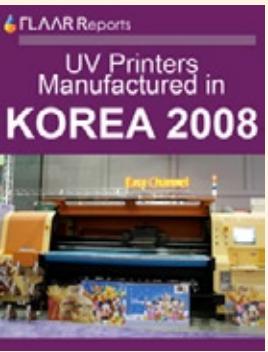
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Comments on UV Inkjet Printers at Major Trade Shows 2007-2009

UV Printers Manufactured in China, Korea and Taiwan

				
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