FLAAR Reports

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Flatbed Cutters

for Flat, Thick and/or Rigid Signage Materials

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Introduction

There is currently a boom in the need for X/Y cutters to contour cut signage and display materials. This rapidly growing market is primarily a result of the increasing sales of UV-cured printers that can handle thick and rigid material. Once these materials are printed they need to be cut.

At trade shows in Europe (such as FESPA) and in the US (SGIA and ISA) virtually every brand of UV printer is selling well. VUTEk sold 250 of their QS2000/QS3200 printers faster then they had estimated. ColorSpan anticipates selling more than 500 of its model 5440uv series printers. Oce predicts they will sell 1000 of their Arizona 250 GT flatbed printers. If the cationic ink in the new Gerber ion printer actually functions by next year, Gerber will sell over a thousand of their dedicated flatbeds.

So you can do the math yourselves: manufacturers of flatbed cutters can potentially sell more of their cutters in 2008 than in any year before (except that now more cutter manufacturers are getting into the action).

Once printshops install these UV printers in their businesses they quickly realize that they need a cutter. So FLAAR is increasingly receiving requests to provide evaluations, reviews, and recommendations on the various brands of cutters.

Presently the following brands are available:

Flatbed cutters at the high end:

- Esko Kongsberg
- Zund

Flatbed cutters at entry-level

- Gerber (bought another company to be able to sell cutters)
- Mimaki (has new models)

The Gerber ion will become the best selling dedicated flatbed UV printer ever launched (if cationic ink works, which 95% of all ink chemists that I have spoken with predict will fail this year, and that cationic UV ink chemistry won't work until into the future), because the same flatbed also has a separate roll-fed UV printer at one end; it is a much better dual-system that offered by any other flatbed. The roll-fed system claimed by Oce has not functioned since a non-moving version was shown at SGIA '06; that of Mimaki's flatbed is only a hook for holding a roll.

FIGURE 1. *MGE i-Cut Kongsberg Esko*

Figure 2. *Zund LR 1600cv*

Figure 3. *Gerber M series*

Figure 4. *Mimaki CF3-1631*

FLAAR Interest in evaluating flatbed cutters

Currently about a quarter of a million people a year (worldwide) read the FLAAR evaluations on solvent and UV-cured flatbed inkjet printers. Another half-million people read FLAAR discussions on water-based printers (Epson, Canon, HP, and textile printers that used water-based inks).

Figure 5a and 5b. *Dr. Nicholas Hellmuth, UV lecturing in Korea for Gandinnovations.*

FLAAR is featured in workshops, seminars, conferences, and lectures in the US and Europe on UV-cured flatbed printers. Everyone who is interested in a UV printer because of these programs will eventually need to start thinking about a flatbed cutter.

Figure 6a and 6b. *Dr. Nicholas Hellmuth, Lecturing in Korea at launch of IP&I 1606*

For 2008 lectures by FLAAR on UV-curable flatbed printers are already scheduled for ten countries! (Balkans and Eastern Europe). In Korea over 100 people attended one lecture.

But more than printshop managers attend, many distributors and resellers attend too, because they need to decide whether to offer Kongsberg, Zund, Gerber, or Mimaki flatbed cutters for their clients.

Figure 7a and 7b. *Dr. Nicholas Hellmuth, Lecturing at a ColorSpan Open House in Cincinnati.*

So, because of all the readers asking for help, and for all the printshop owners and managers attending FLAAR UV workshops worldwide, we recognize it is essential to provide information on the entire workflow. A crucial part of the workflow for UV-curable wide-format inkjet printers is finishing: this implies cutting (and lamination).

Plus I have a personal interest in UV cutters, namely for making museum displays of pre-Columbian artifacts related to Maya archaeology of Latin America.

Figure 8a and 8b. *Dr. Nicholas Hellmuth, Lecturing for Mimaki Open House and launch of their new flatbed printers for Europe.*

Figure 9a and 9b. *Dr. Nicholas Hellmuth, Lecturing at UV-curable flatbed inkjet printer conference in Athens.*

For all of these reasons FLAAR appreciated being invited by Zund to visit their headquarters and factory and to learn about their flatbed cutters. At a trade show things are too hectic in a booth to get training; it is much more realistic (and productive) to receive training, and do testing, in the demo room of the manufacturer.

Zund is located in Alstätten, Switzerland. Zund cutters are assembled here, all parts are totally made within a 20 km radius or the city. Zund is a Swiss company that is known internationally. Zund started making cutters around 1984.

The model being evaluated is the XL 1200, the XL means the length of the Y axis which is 2200mm and the length of the X axis which is 1200 mm.

The basic frame of the cutter is a flatbed with a vacuum to hold the material down. The flatbed has a bar that can slide from one end of the flatbed to the other, and the bar holds the toolhead that slides all the length of the flatbed, thus making it possible for the toolhead to move all over the flatbed in a X, Y quadrant. In this way the cutter has an X, Y grid in which the software makes it move, making it possible to operate and cut in any area of the Flatbed.

The flatbed is covered with a special mat that can withstand to some degree the wear of the different cutter blades and router bids. Though sometimes another special matt is used to protect this surface. According to the Zund technician, the way to keep the matt and surface in good conditions is by adjusting the pressure and height of the blade being used. In other words it has to be fined tuned so it does not damage the surface.

Their plotter can be used with several different tool heads. Tool heads are the part of the plotter that has the tools to cut. According to the catalogue there are up to seven tool heads available, that can be used with different type of blades and tools for different applications, 1 cutting and plotting head, 1 CCD camera for automatic registration, plus 4 special tools, Electric oscillating tool, a Pneumatic oscillating tool, a Driven Rotary tool, and a Mount Cutting Tool.

The principles behind the cutting process are all based on the main laws of basic physics. The difference is that all instruments are made with higher quality so they can be more precise, that's what Swiss are known for.

The tools are used depending on the material that will be cut: wood, PVC, Acrylic and metal can be routed.

Routing is used for any material that cannot be cut with a standard blade. This process is made by a routing bit, that turns around up to 5000 times per minute routing the material. Hard material can be routed like wood, Dibond, Forex and Plexiglas, just to name a few.

The routing bits are made of Tungsten-Carbide, The blades are used according to the thickness of the material.

Aspects to consider in order to choose the proper blade:

1. Thickness of the material.

2. Whether if its going to be through cut or kiss cut. (Kiss cut is used when making stickers, so you don't need to cut all the way, just a part of the surface. But for this the pressure of the blade needs to be adjusted to fit the weight of the paper being used or material.

3. How sharp are the turns in the material, it is possible to break the blade if the materials are too thick and the turns are too sharp.

4. Creased, is used for making boxes (cartons)

5. Other tools that can be used are (pens, so makes the cutter into a CAD plotter)

6. The flatbed can be custom made for larger materials.

7. The router bid size determines the detail of the cut.

Different materials require different type of blades, also.

Testing the Zund Flatbed Cutter

For our evaluation we used a set of Mayan figures from polychrome ceramic funerary vases of the Museo Popol Vuh, Universidad Francisco Marroquin. The goal is to evaluate if the materials printed by a UV-curable printer and flatbed cutter could be used for museum displays.

For that we prepared a set of figures from the FLAAR archeological photography archive. The photographs where taken using the Betterlight camera, a high resolution digital scan back invented by Mike Collete at Betterlight. The images depict scenes from Mayan art and Mayan mythology.

The digital files were about 300 MB each and at 300 dpi, but had to be reduced to 150 dpi and a size of 22 x 13 inches, in order to transport the images once printed.

The workflow used to prepare the images is as follows, the following workflow is the manual way and it is not the only way to prepare them. Zund has just launched a new software called Prepare it, and it's aimed for a more automated workflow. Since we didn't have a cutter, we prepared the files in the manual way.

1. Generate the vector paths: the Zund cutter is made to be used with different kinds of software, This is one of the positive aspects of the company, they don't want to limit the user to one kind of software. All the software of the cutter does is read the vector paths, in that way it can follow an X and Y coordinate grid.

Paths can be generated with any kind of software that can generate vector data, in our case we used Adobe Photoshop CS2 to generate vector paths, but they can be also generated from Illustrator, InDesign, QuarkXpress, Vector Works and other known programs.

We used Adobe Photoshop for the reason that it was already known to us. From Photoshop the path was exported to Adobe Indesign, with the export option in the file dialogue box (screen shot), actually Adobe Photoshop only saves a new file with the extension ".ai"

2. Once the path is generated it is then prepared for the cutter by adding a series of register marks.

The file must have a series of reference points called Register Marks in order for the plotter to recognize the orientation and the distortion of the image. So vector points need to be added to the file. The vector points can be as few as four or as many as they can be placed in the image but will have to be no less than 6mm in diameter.

Then this image was printed with a Zund 250-combi UV hybrid-style flatbed inkjet printer.

Figure 10a. *Zund LX1200 flatbed cutter with archaeological simples, being routed*

Figure 10b. *Plexiglass is one of the several materials available that can be printed or cut.*

Figure 11a. *The toolhead can hold several different kinds of tools, in this image a router bit is used to route a printed plexiglass, the use of this material will be to used as museum displays*

Figure 11b. *Tool pressure is adjusted from the main console.*

Figure 12. *Dibond can also be routed.*

The points are read by the cutters digital camera, and are aligned by the operator, the camera is on the toolhead of the cutter. The camera needs to be adjusted to the surface of the material being used, since different thicknesses will mean that the camera will focus at different distances, There is a tool that adjusts the camera to the height of the material.

Once the camera is adjusted it will start reading the reference points one by one before beginning to cut, the operator can here rotate the image file (path file) in order to agree with the toolhead.

So basically the toolhead is controlled by the camera reading the reference points and then following the vectorial paths of the file.

For our evaluation we used the I-Cut (Marca registrada) plugin for Adobe Illustrator, that can be downloaded from the MGE website.

The plug-in is installed like any other plug-in for Illustrator or Photoshop,

The plug-in generates a series of register marks automatically with some options to adjust the thickness and the amount of register marks that will be placed on the file. What the plug-in does is that it generates a series of register marks following the edge of the vector paths. All points are placed on the outside border of the path to be cut.

The register marks are created on a register marks layer, which has the same name.

Note:
When importing vector paths from Adobe Photoshop to illustrator, they won't be visible, with the selection tool; select the canvas, and this will make it visible.

In order to see the path, it was our path we selected it and gave it a 0.3mm stroke, but that's not necessary for the final file. We only used it to see the outline. Once used the stroke is eliminated.

Figure 13. *From the computer screen the software is programmed to read the vectorial paths of the file to start the cutting process.*

Figure 14. *In this image you can see the digital camera of the cutter, in the surface also are registered marks that are followed by the camera to guide the routing head in the routing process*

We recommend you make sure your paths are always selected when working on it.

3. Image file. The image file is placed in the vector path file, we recommend you make this step after you have your register marks on the file, because the I-cut plug-in wont recognize the pixel data of the image. And also place the image file on a different layer.

The file has now 3 layers, a pixel based layer with the image, a vector path layer and a register mark layer.

4. The file is saved and exported as a PDF, AI, or EPS format.

Once the file is ready you can save it as a pdf, ai or EPS format,

Since this is the manual way of preparing files we suggest you check on Prepare it (which is a client-server application), this wokflow was a test workflow

5. Two different files are created from the same file

The last step is to create two different files, a pixel data file for the printer to print the image, and a vector path files for the cutter. The vector path doesn't have to have any pixel data. Only the vector paths and the register marks, so the image file should have also printed the registered marks.

Once the registered marks are printed on the material then the camera can recognize the image distortion and angle and start cutting.

Other aspects

Adjustable vacuum to clean the surface as it is cut, also the flatbed has a vacuum table.

All pressure, and size of material can be adjusted from the control panel, the cutter can be stopped and then can continue without any problem, the job can be stopped at any time.

For our evaluation we used 3 different kinds of materials

- Dibond
- 10mm Forex
- Plexiglas

All this materials were cut with a router bit.

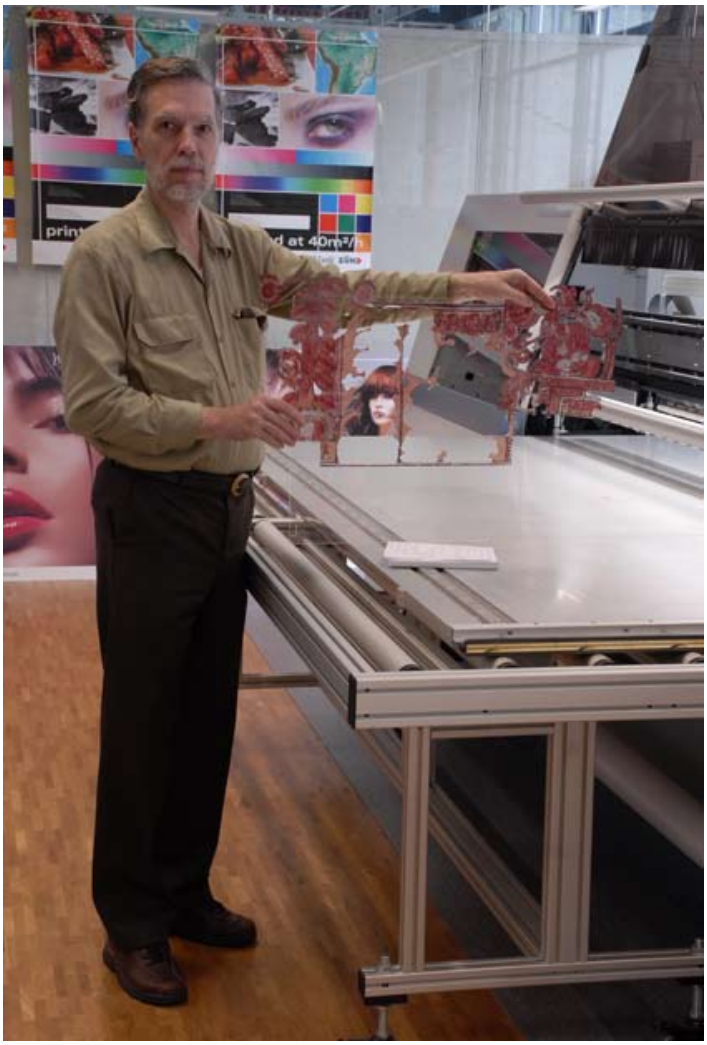

Figure 15a and 15b. *Nicholas Hellmuth showing samples of different materials.*

Results

The prints were beautifully printed and the cuts with the Zund LX1200 were perfect. The main errors were in the cutting paths done in Adobe Photoshop back in Guatemala. This can easily be corrected. Since these cutters are made in Switzerland, it is natural to expect precision results, especially from a company that has been making this equipment for many many years. I lived in Zurich for three years and have experienced Swiss workmanship.

Figure 16. *The detail at which material are cut, is quite outstanding, taking in consideration the angles outlined by the figure.*

Other Applications

Cutter, for PoP displays, figures,
Packaging industry,

Sample boxes
Prototype packaging
Model packaging
Package
Boxes of different designs
Dial buttons
Screen printing sticker
Stickers
Puzzles,

Textile industry
Leather
Shoes
Car seats
Furniture

Figure 17. *Other applications, designed boxes can be made as prototypes for advertising campaigns.*

Figure 18a and 18b. *Photographs, puzzles, wood, are other applications that can be handled by the cutter.*

Figure 19a and 19b. *POP displays are one of the most popular items to be cutted.*

Figure 20a and 20b. *Stickers can be thorough cut, and the production process is reduced to programming the cutter and feeding the material.*

Next Step

Our next step is to design a complete museum exhibit, at life-size. The initial test was at a small size whereby we could put the resulting cut-out figures into our suitcase to bring them back to Guatemala as samples. It would have been too expensive to ship back 1:1 lifesize figures. It would make more sense to print them in Guatemala: there are plenty of flatbed UV printers in Guatemala. Only issue is that so far we have not found a single flatbed cutter in Guatemala: everyone cuts by hand here.

We are also keeping our eyes-and-ears out for comments from end-users (at printshops) what they say about Kongsberg, Zund, Mimaki, and Gerber cutters. There is a clear perception that two of these brands are high-end, and two are entry-level. Notice I say “perception.” Most of these printshop owners have not used a Mimaki or Gerber cutter, but their perception is that they are not as precise as the Zund or Kongsberg equipment. So far, the majority of the printshops that I visit which have any flatbed cutter at all have either a Zund or a Kongsberg. They all state clearly they would not consider a Mimaki cutter because they perceive it as entry level. They don’t comment on the Gerber cutter because it is too new.

So the natural question is, is the Mimaki CF2 or newer CF3 cutter really like what people perceive it to be? In other words, what if we have an opportunity to test the Mimaki cutter in person, might we learn that it cuts and functions just fine?

The same may be the story with the Gerber M Series cutters, M-3000, M-1200; they may be adequate or even they may be fully acceptable. This needs to be documented by actual tests, not people’s preconceived impressions. FLAAR prefers learning from actual practice, since usually you find that that common perceptions are not based on actual familiarity, but on misconceptions (normally called hearsay). Thus we will continue our program to learn more about flatbed cutters of all brands.

FLAAR will also be expanding our coverage to upright trimmers such as Fletcher-Terry and Keencut.

Since Zund was the first cutter/trimmer company to initiate a program of sponsored research, that’s why our first report is on this brand. Universities in the US no longer provide professors with research funding; we are told that we have to go out and request sponsored research projects from industry. This is why in 2006 FLAAR began to visit manufacturers of UV printers: to present we have visited GRAPO (2006), Gandinnovations (two days), IP&I in Korea (a week), Sun LLC in Russia (a week), Sun Chemical, FastJet (2007), Inca Digital, VUTEk (three trips this year alone), NUR (two visits each for several days), MacDermid ColorSpan (once a year for several years), and Zund (two days). By the time you receive this PDF we will have visited GCC and Eastech in Taiwan and Dilli in Korea (each for two days).

Acknowledgments

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Lilian García, an architecture student working at FLAAR Mesoamerica in Guatemala helped in the elaboration of the files. We thank the Junta Directiva and Curator of the Museo Popol Vuh for their interest in learning about innovative technology as a way to improve museum displays.

This report is based on the visit made to the Zund Factory on the 31st of May and 1st of June. Some of the photographs are based on visiting the Zund booth at trade shows in the US and Europe over many years.