

How to print on Ceramic Tiles?



Fine Art Giclee & Architectural
Decoration on ceramic tiles



Ceramic tiles Shenyang Complex Temple.

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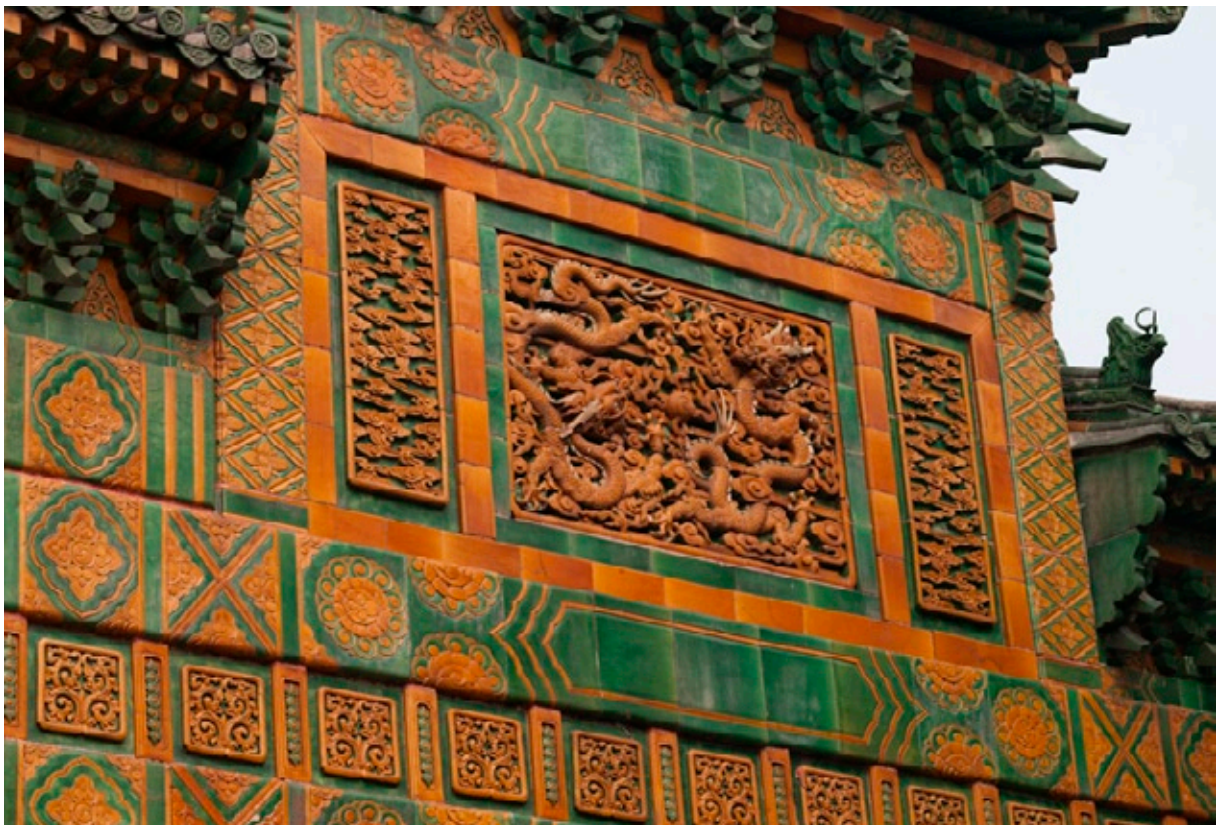
World-class art of fired ceramics has been developed over a thousand years in China. Many of the great historical landmarks in China are handsomely decorated with works of art in fired ceramics. Here you see some examples that I inspected in northern China in 2010. I was in China five times during 2010, as consultant for various companies.

You can also find fired ceramic art in other civilizations. Some in raised-relief (like these Chinese examples) but mostly as floor tiles or wall tiles. Today you can reproduce these as digitally printed decorations, at least the flat tiles (digitally printing on 3D ceramic tiles is not realistic, yet, for a normal giclee atelier).

Since my background is in architecture, and in archaeology, I have a long-time interest in decorating building materials. So I have spent a lot of time learning how to print on tiles with digital inkjet.



Nicholas has been in China five times in 2010 and once a year the previous three years.



Ceramic tiles Shenyang Complex Temple.

What are your Options for Inkjet Printing on Ceramic Floor Tiles?

I will speak primarily about ceramic floor tiles, though obviously you can also make wall tiles. Wall tiles can be for kitchen, bathroom, or other rooms. Just that in North American culture, tiles tend to be limited to bathroom and kitchen.

But you can always break out of the mold and use tiles anywhere in the house.

The following text is a year 2011 update of several years of research while a Visiting Professor at BGSU in Ohio. Although FLAAR has always been independent, we have occasionally allied ourselves with universities.

This is a companion piece to the FLAAR Report Printing on Doors and Printing a Table Top. The three reports:

- Printing on Doors,
- Printing a Table Top,
- and the present Printing on Floor Tiles,

are progress reports of a long-range research project for printing options for architects and interior decorators.

	
<p><i>This Reports will be ready by late December 2010 or early January 2011</i></p>	

This research project began with curiosity about wide format inkjet printing on textiles such as cotton, polyester and silk. The FLAAR Director, Dr Nicholas Hellmuth, comes from a family background of architects, he studied architecture at Harvard, and for many years FLAAR was associated with the architecture departments of both universities where FLAAR had offices (BGSU in Ohio and UFM in Guatemala, circa 2001-2006).

Every substance and material in a building can be printed on or decorated with a wide-format inkjet printer (if you so desire). Today you can run doors, windows, Venetian blinds, wall sections, floor tiles, ceiling tiles, table tops, and refrigerator doors through wide format flatbed inkjet printers.

We are especially interested in all aspects of wide format printer usage for museums and educational parks (such as archaeological sites, which are usually large outdoor museums). Machu Pichu in Peru, Chichen Itza or Tulum in Mexico would be examples, as are the pyramids of Egypt.

We used ceramic tiles but a UV-curable ink printer can also handle other floor, wall, and ceiling tiles and comparable architectural and interior decoration materials. But you need to be sure to acquire the FLAAR Reports on UV-printer applications and materials, since printing on everything is not the same as the ink sticking to everything you print it on.

When you go to a trade show you see every imaginable size and shape of object decorated with inkjet printable images. At either ISA or SGIA signage printer trade shows you can even see bathroom toilets and sinks decorated with inkjet printed transfers. But seeing a bathroom sink customized in a trade show booth is not the same as actually putting your own photographs or art onto your own bathroom fixtures.

Since we have not yet reached the stage of printing on three-dimensional furniture (it can be done and is accomplished commercially already, just that we don't yet have this particular equipment). We figured it was more realistic to start by printing on doors and floor tiles.

Diverse Technologies for Printing on Tiles

There are at least three inkjet printer technologies for printing on floor tiles.

- Dye sublimation heat transfer
- Direct printing with solvent ink printers
- Direct printing with UV-cured ink printers.

Dye sub means printing on transfer paper and then using a heat press to transfer the image via sublimation onto the tiles. We cover this with an entire report in the FLAAR Series on printing signs with inkjet printers.

Direct printing with solvent ink printers onto tiles is rarely done, but it is possible if you have a flatbed solvent ink printer. You would tend to need tiles that can accept solvent inks. Keep in mind that both dye sub, solvent ink, and UV-cured ink are for printing on tiles after the tiles have come from the kiln. If you need to bake the design into the tile, that involves other technologies. The best place in the world to learn all this would be trade shows in Italy, since Italy is a world leader in decorating floor tiles. The present report is a FLAAR Fast Facts on printing floor tiles with a UV-curable ink flatbed printer.

The first Experiment: UV-cured ink

There is a Home Depot near BGSU. Solid white tile, 12x12 inches, #177-412, comes in packs of 11 tiles. Why they don't sell an even dozen escapes me. So I bought one pack of 11 tiles.

Because a good UV-curable ink flatbed printer costs about \$250,000, we don't have one (at least not yet, though we hope to before summer 2005, in part because entry level models are now \$75,000, such as from ColorSpan). But a print shop in Toledo, Ohio, has a Durst Rho 160, so off went the doors and tiles to SFG Graphics.

Since this was the first time I had ever attempted to print directly on tiles, and as we had only a few days (and zero budget), we had to use whatever miscellaneous images we had available. I selected some photos of bromeliads, orchids, a butterfly, and some indigenous Mayan weavings of Guatemala.

It took longer than expected to print on the doors so the tiles were delayed until the next day, when I was not present. Thus we don't have step by step photos. The doors took longer than we expected the first day because the printer had to be set-up for the thickness and width of the doors. Then the printer had to be set-up for the thinner and smaller tiles. The tiles, being smaller, also required some experimentation (as you can see by the results). It is clear that we should have run even more experiments, but at \$400 per hour we took the first run off the machine.

The images got cut off during resizing by the operator in the RIP. This is not an error of the printer itself, but rather a misinterpretation of the desired design.

One of the first things we learned is that motifs that look stunning as a photograph, do not always translate well into square format and onto the rough surface of a tile, especially not with the relatively matte surface of UV-curable ink. Most of the bromeliads did not "fit" well; those that did were too closely cropped. The only two designs that looked okay were the butterfly (which obviously had an accident in the resizing mode in the RIP software), and the Mayan textile pattern from Guatemala.

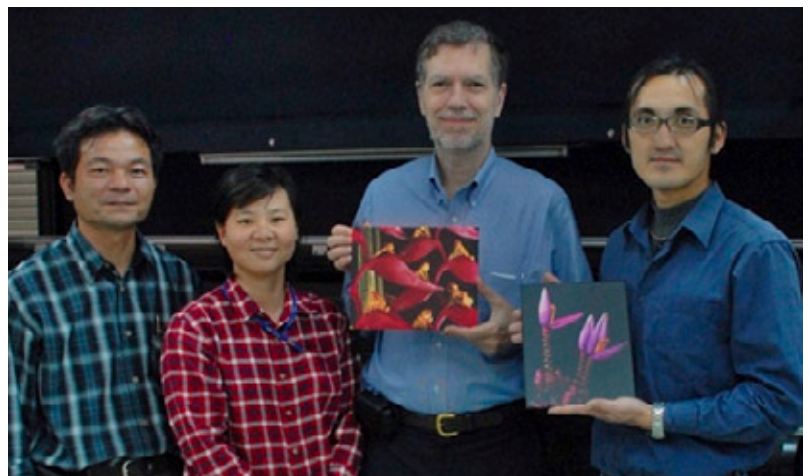
Any time you run any material, whether it be canvas, or floor tiles, you may have to do a trial run. This gets expensive when the material is a door that costs \$20. Two of the door images were most politely described as experimental meaning that if this had been intended to produce commercially viable products, we would have had to throw \$40 worth of doors away. On the tiles two were victims of printer experimentation and the rest were victims of design considerations. Overall I was content with the research experiment because I had learned from every mistake. Our next run will be much better planned, and executed, especially when we have our own UV-curable ink flatbed printer in-house.

We also intend to experiment with window glass, window shutters, Venetian blinds, table tops, and other items of furniture, interior decoration, and parts of buildings, such as ceiling tiles.

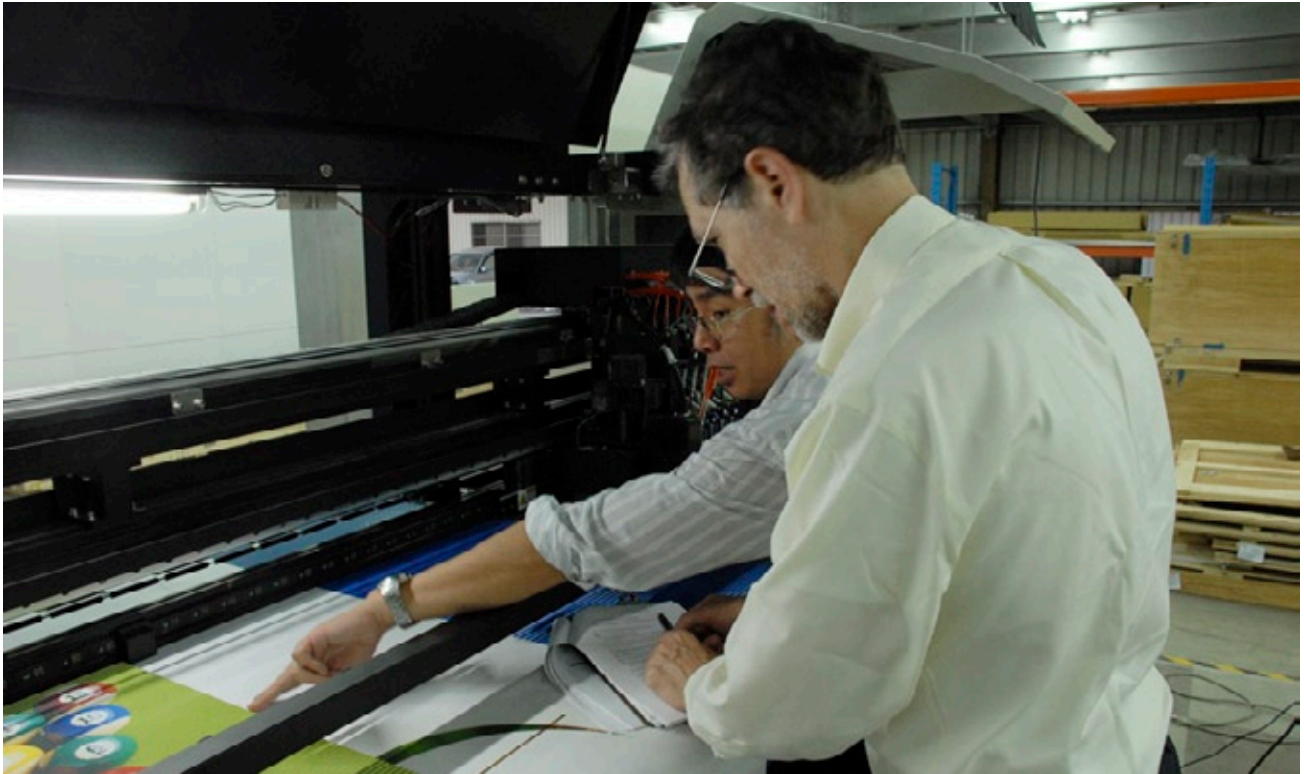
Printing Ceramic Tiles with GCC

The main advantage of printing tiles with GCC is that they have developed their own printer chemicals specifically for tiles, and they have developed experience in how to heat the tile after printing.

Most manufacturers will either not warn you about the full workflow or otherwise the manufacturer itself will not have adequate experience. Unfortunately GCC has not been successful selling many UV-cured printers and have not come out with any new models in the last three years.



Dr. Hellmuth at GCC site visit.



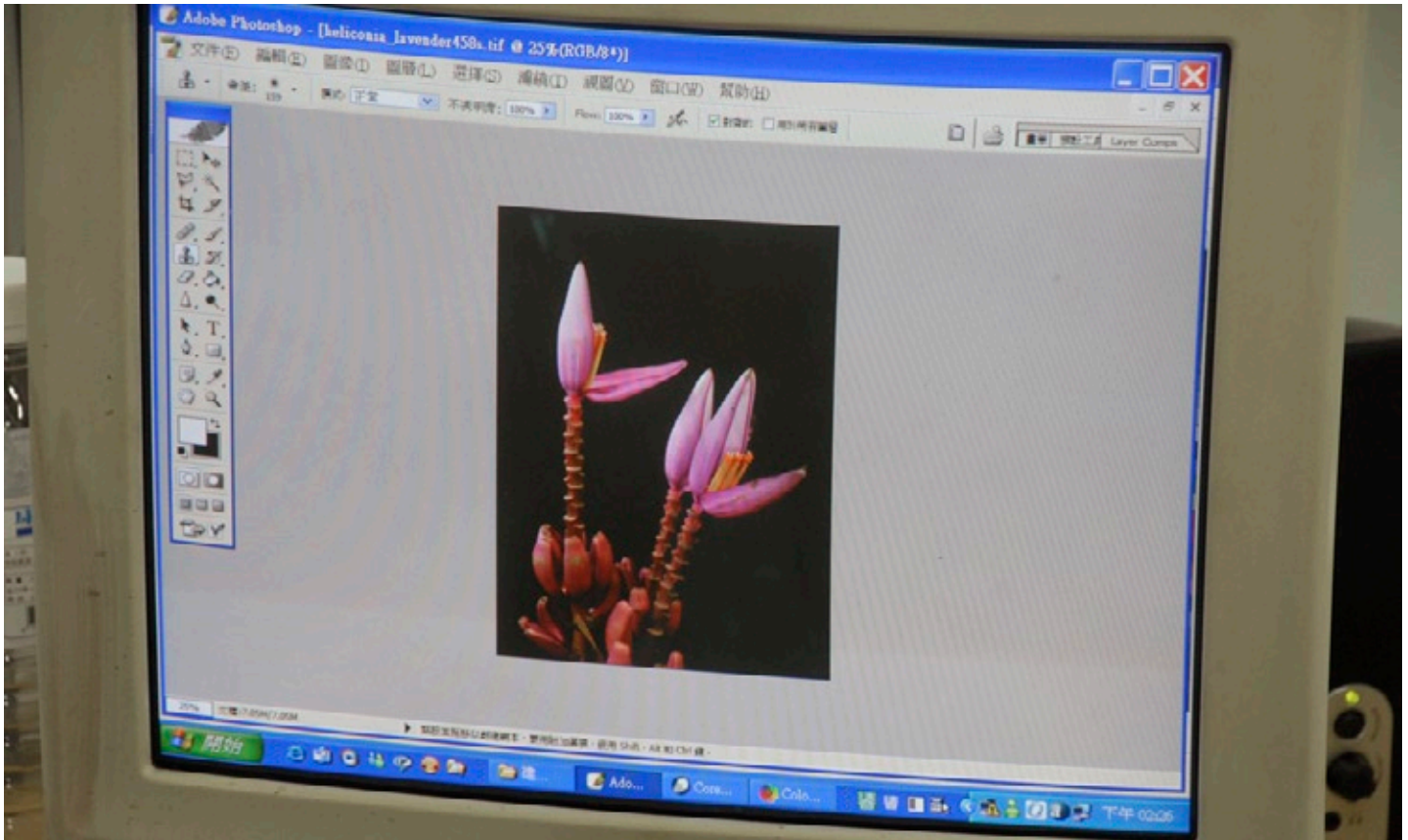
Dr. Hellmuth at evaluating the GCC ceramic tile printer.



Dr. Hellmuth at evaluating the GCC ceramic tile printer.



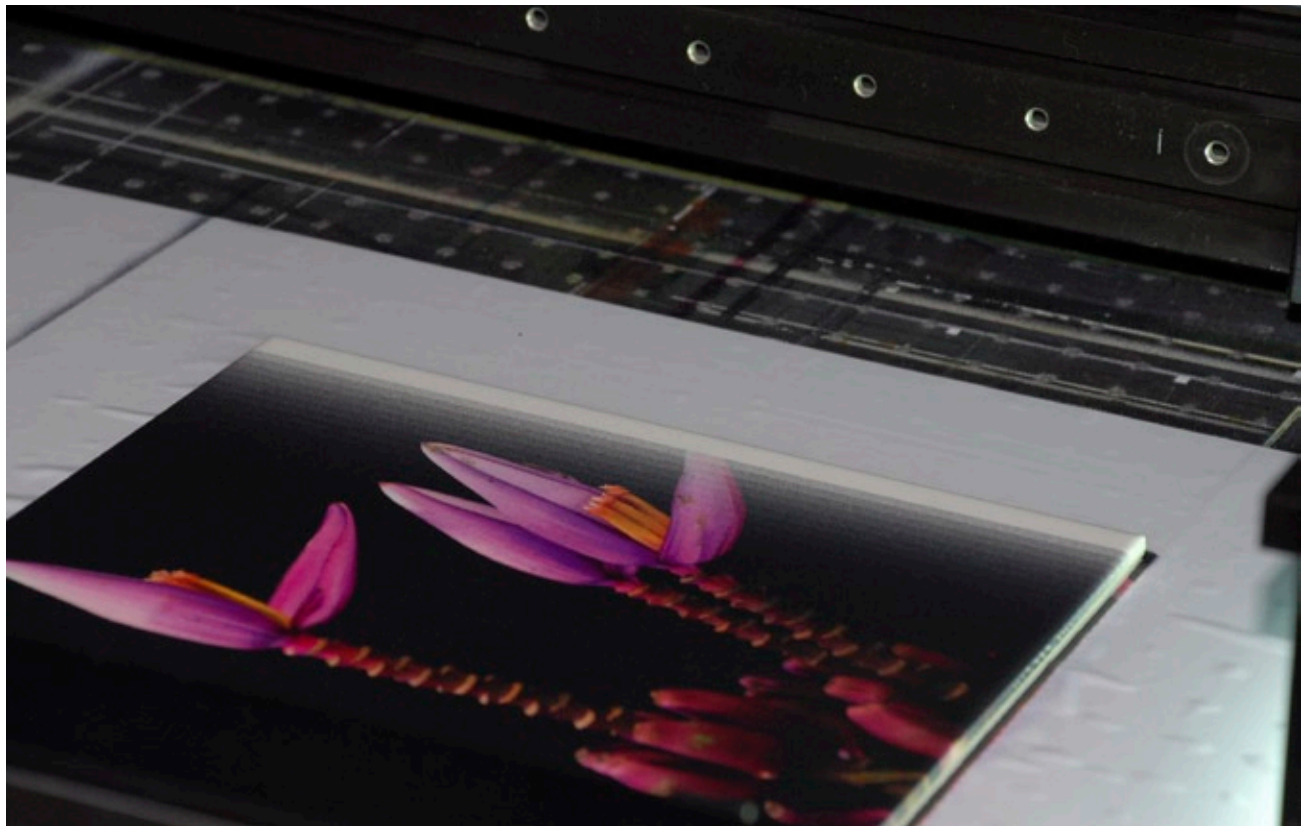
Ceramic tiles samples printed at GCC facilities.



FLAAR Reports photography printed on ceramic tiles on a GCC printer.



FLAAR Reports photography printed on ceramic tiles on a GCC printer.



FLAAR Reports photography printed on ceramic tiles on a GCC printer.



Printing Ceramic Tiles with Eastech

About once every two years you see an Eastech booth at a trade show somewhere in the world. One year it may be DRUPA, then nothing the next year. Then perhaps FESPA. And in 2010, at Glasstec decoration expo in Germany.

I have known Robert Pan and Eastech for over a decade. He sold Mutoh-related solvent printers in the beginning years. Then for about four years he was actually one of the more innovative sources of UV-cured machines. These were soft of Mutoh on the inside but had his own shell around the outside. It is ironic that Mutoh itself, neither Mutoh Europe nor Mutoh Japan ever was able to build a UV-curing printer in those years.

Then too many other competitors came into the market with newer UV-cured printers and Eastech dropped out of the market, at least for Europe and the Americas (not enough dealers in these world areas to maintain a consistent presence).

One other reason for dropping UV-cured printers was that Eastech developed a relationship with a company in Japan with an innovative ink. The goal of this ink was to print on everything. Robert Pan named it Magic Ink.

So for the following years, his booth showed every conceivable kind of architectural and signage material. He claimed that it was all printed without primer.

Of course this was unrealistic: you can print without primer, but the ink won't stick if you scratch it. But all the claims were, "no primer."

So I made an appointment to visit his offices in Taiwan. But when I arrived, he was not there and there was no one in the Eastech office who was prepared to receive me. So I have never been to the Eastech headquarters in Taiwan. But since I flew there for the meeting, as long as I was stuck in that part of the world, I visited GCC.

Ironic that here I saw about the best.



Dr. Hellmuth at EASTECH demo room site visit, ceramic tile sample.



EASTECH Printer ceramic tile sample. This kind of printer is not available in US or most countries. Also is very very slow, and some materials the ink did scratch off. We suggsst instead that you consider UV-cured ink or resin ink such as Sepiax. And it is also important that the dealer or distributor you go to, that they handle a wide range of printers. This is why we suggest Global Imaging. And if you prefer a used UV-cured printer, consider their Global Garage.



EASTECH Printer ceramic tile printer.





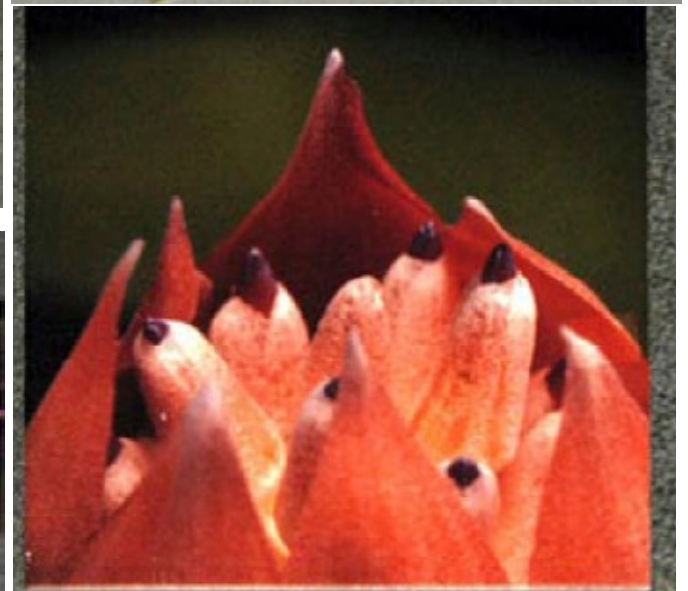
EASTECH printed tiles and concrete samples. But UV-cured ink works as well if not better, and UV-cured printers are much faster. Printers with Epson printheads are slow, and clog too much.



EASTECH printed tiles, glass and concrete samples.



EASTECH printed tile samples.



Ceramic tiles printed at SFC Graphics, Toledo, Ohio, with UV-cured combo style printer.

Printing Ceramic Tiles with Jetbest

Jetbest makes an ink in Taiwan which is still relatively new. I have never visited the factory and have not spoken with end-users, so we do not have documentation of how this ink functions, or not, out in the real world.

Until we can visit end-users, we are not able to recommend any ink.



Jetbest booth at FESPA Munich 2010.



Ceramic tile sample printed by Jetbest ink. There is no FLAAR Report on this ink because we have not visited the factory nor done a site-visit case-study. Also, alcohol-based ink is not well documented in the industry (a polite way of saying that we need more documentation on Jetbest ink before we can issue any recommendation).



Jetbest ceramic tile printed sample.

Printing Ceramic Tiles with Resin inks (Sepiax)

With Sepiax it has been possible to visit their demo room twice; one in 2009 and once in autumn 2010. Sepiax has set as their goal to make an ink that prints on as many substances as possible with minimal unpleasant chemicals. So Sepiax has fewer co-solvents than latex ink. The MSDS of Sepiax ink sure is a lot more user-friendly than the rather complex chemical composition of Mutoh Bio-lactite ink.

I have seen Sepiax water-based ink print on leather and glass. I would need to test its abilities to print on ceramic tiles.



Dr. Nicholas Hellmuth with Sepiax Ink Sample.



Dr. Nicholas Hellmuth with Sepiax Ink printed samples.

Other Alternatives

**How could we have printed on these tiles otherwise?
And achieved a brighter image?**

First, we could have tweaked the image, such as by boosting the saturation.

Second, we could have spray-treated the surface of the tile pure white, primed it with inkjet receptor material, and then run it through an Encad NovaJet 850.

Third, we could have painted the entire surface of the tile white and run it through a UV-curable ink flatbed printer.

Option four for decorating a wooden door would be printing on glossy paper and applying the glossy paper to the door; this is not a serious option for a floor tile.

But with the floor tile two more options do appear:

Fourth, run the tile directly through a flatbed solvent ink printer such as those manufactured by Sprin. This narrow format printer can print on one tile at a time, but at high resolution. It would probably be necessary to prime the tile, and it would take a long time to dry (during which time it would outgas solvents).

Fifth, obtain a tile whose surface is prepared for receiving dye sublimation heat transfer. In this technology you print onto transfer paper. You take the paper and put it on top of the object you wish to transfer the design to. You use an iron or heat press. The heat sublimates the ink into a gas which permeates the primer on the surface of the tile. This would probably give you the brightest tile of any process.

But I was determined to print directly onto a floor tile from Home Depot and that is exactly what I did.

Three different FLAAR Reports of various premium series cover the theory and technology involved in several of the other alternatives.

Summary

Although this report discusses floor tiles, the same tiles can be used to create wall murals. You can also obviously use these tiles in your bathroom.

Where to get further information

You can ask FLAAR for consulting services, or, you can simply contact Global Imaging and ask them directly. The benefit of Global Imaging is that they offer many different brands of printers, and several different kinds of inks.

FLAAR Consulting Services
UV-cured, latex, solvent
(all flavors)
& all future ink printers too
(SepiaX, etc)

RIP Software
& printable substrates
plus Laminators & Coaters

FLAAR Educational Programs & Services
Consulting Services
(wide-format inkjet
printers, RIP,
ink & substrates)

for Financial Analysts,
Investment Companies,
Marketing Strategy Planners

Consulting
Services
for Manufacturers

FLAAR

Consulting services FLAAR Reports.

Appendix A

Commercial, Production, Machines for printing on ceramics

Dedicated ceramic production machines; in-line

Cretaprint

Durst

Jettable

Kerajet

Newtech

Kornit

Regular wide-format inkjet printers that can print on ceramic tiles

EFI Rasktek T660

EFI Rastek T1000

GCC

Mimaki flatbeds (but avoid all models before 2009)

various brands of VUTEK GS and QS printers

Several brands of UV-cured printers can handle ceramic tiles, but the distributor we know the best, for over six years, is Global Imaging. Plus they are one of the few dealers for North America that also offer used printers (almost all brands).

And, Global Imaging can handle most countries in Latin America, and for used printers has a partner in Europe.

Global Imaging contact info:

e-mail: info@globalimaginginc.com

Tel: 303.673.9773

Toll Free: 800.787.9801

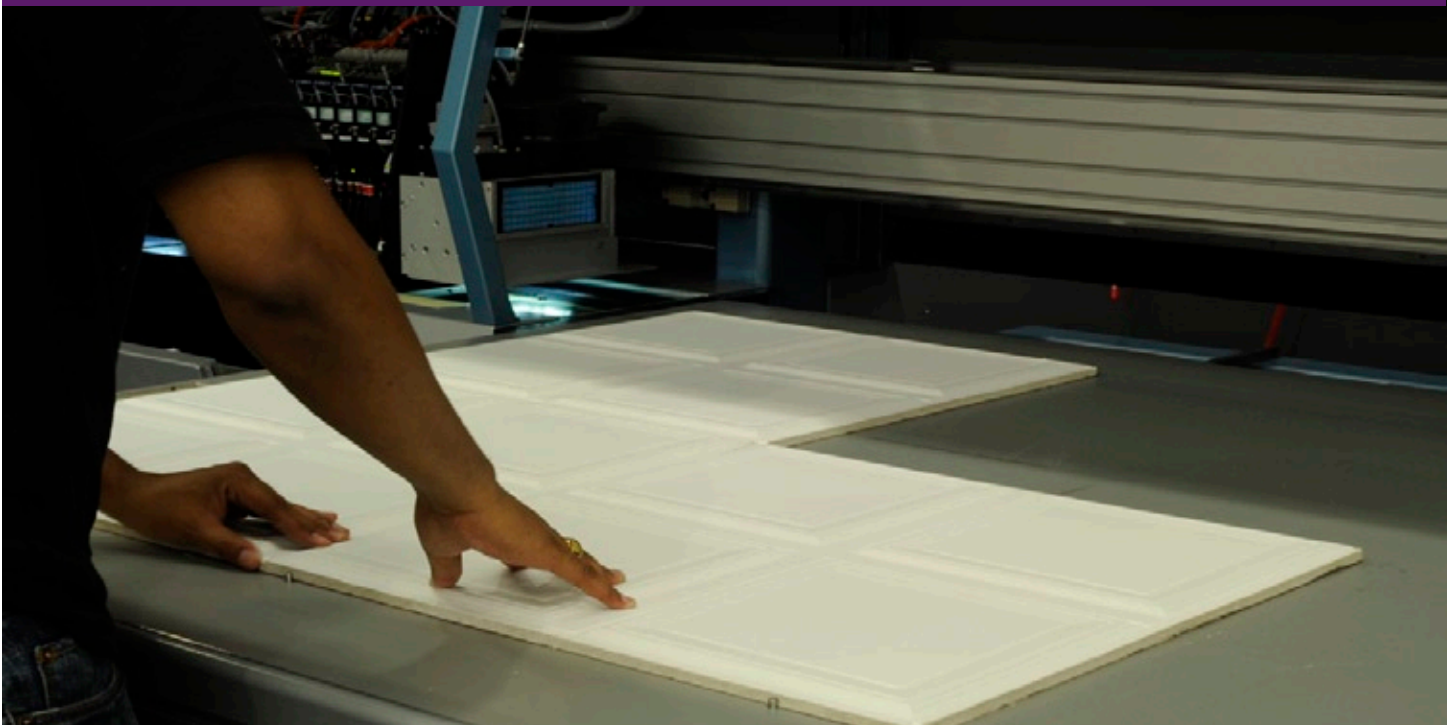
Fax: 303.673.9923

Appendix B

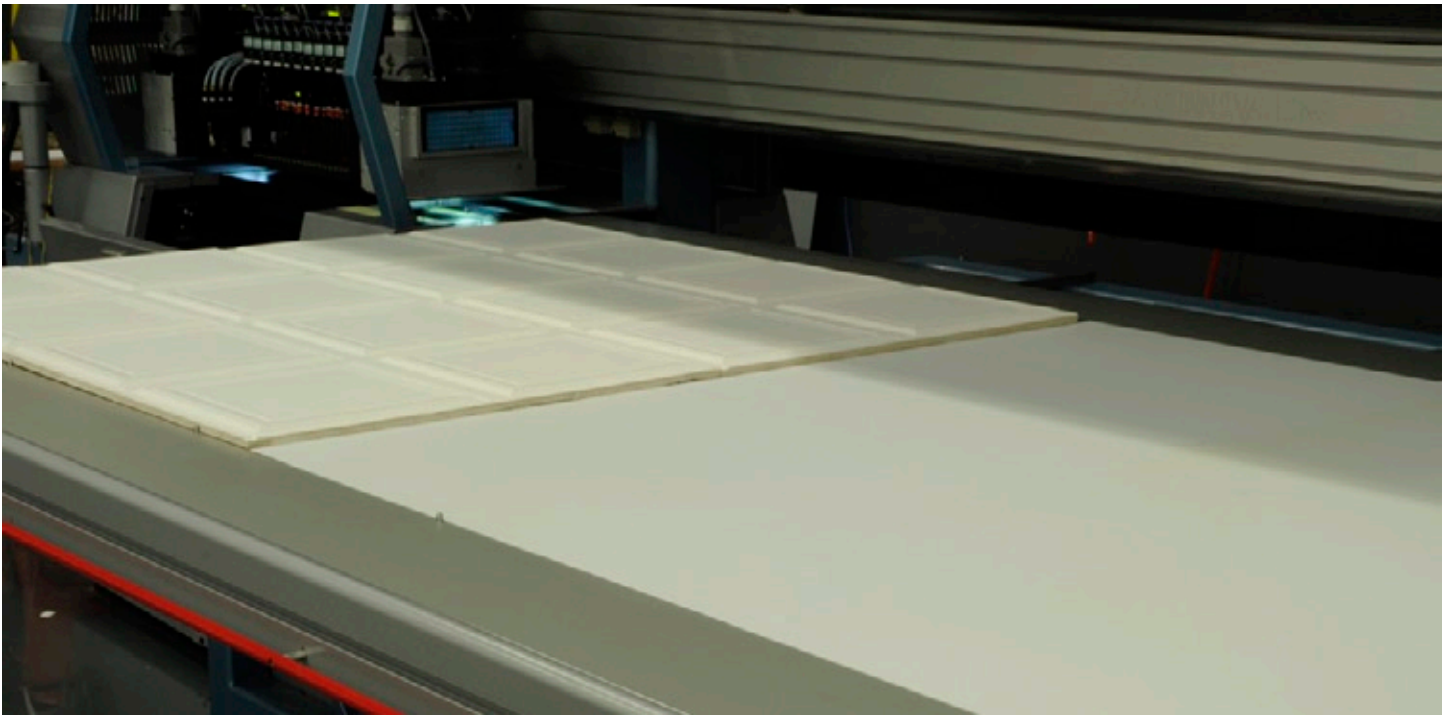
Ceramic tiles, good example of bad printing sample



Dr. Nichollas Hellmuth site visit at Ganndinnovations demo room to evaluate their printers.



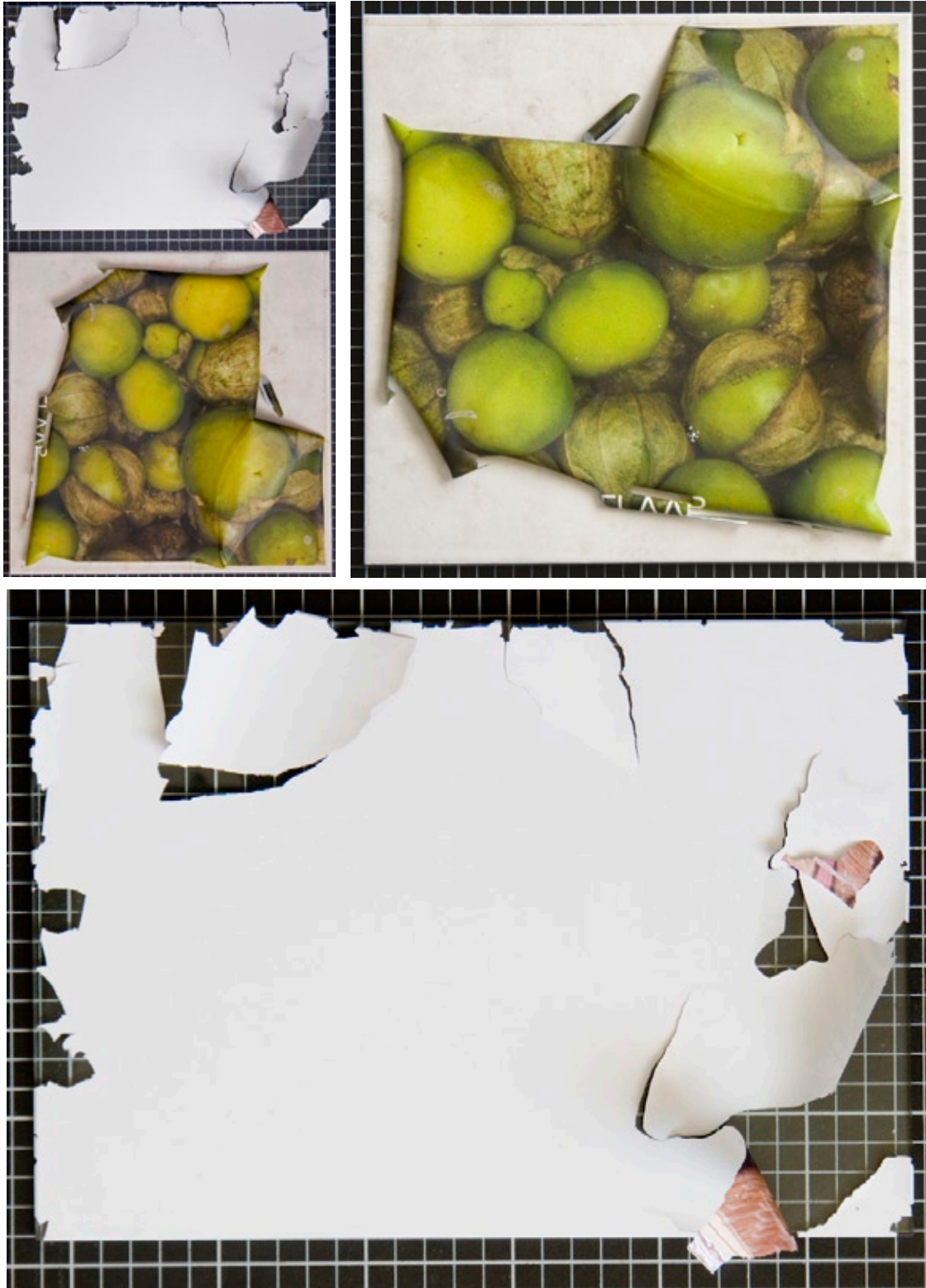
Ganndinnovations 1224 printing on tiles.



Ganndinovations 1224 printing on tiles.

How to print on Ceramic Tiles? Fine Art Giclee & Architectural Decoration on ceramic tiles





Ink falling of tile printed by Gandinnovations.



Here is the entire layer of ink, completely fallen off the ceramic tile.

This is what happens when you try to print on a smooth surface without primer.

The ink began to bubble up after a few months. Before the year was out, the ink was off the tile. Later the ink simply came off the tile totally (as you can see here).

So be sure when you contact a company that sells UV-cured printers (or printing services) that they know about primer.