Lithographically Printed Ceramic Decals

Syracuse China (Onondaga Pottery Company) onglaze decal process using Lithographic methods

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Abstract

This research was done to resurrect and understand the traditional process of printing ceramic china decals lithographically. Prior to World War II, Onondaga Pottery Company (O.P. Co.) had been manufacturing a variety of ceramic products. The company was world renowned for its fine residential china and commercial hotel and restaurant ware. In 1893, Onondaga Pottery Company won the High Award Medal for its ornate vitreous china known as Imperial Geddo at the Columbian Exposition in Chicago, and in 1904, the company won the Grand Prize of Clays and Tableware at the Louisiana Purchase Exposition in St. Louis (Hunter, 2019). In 1896, the company installed the ceramic industry's first in-house lithographic shop for printing decals that decorated their famously known Syracuse china. This process was replaced in the late 1930s with the shadowtone process; an airbrush design that sprayed colors onto the ware through stencils (Hunter, 2019). This was a quicker and cheaper way to decorate the wares.

I theorized that if I found common metals in lithographic inks and ceramic glazes I should be able to print with the lithographic inks and render similar glazing results. I was interested to see if lithographic pigments held their color and detail as a ceramic glaze would without burning out in the kiln. To accompany this theory, I also tested the traditional method of decal printing used for Syracuse china. The designs were drawn on limestone, printed in a stiff varnish, dusted with fine ground onglaze color, sealed with a covercoat, and then fired at low temperatures to allow the pigment to seep into the glaze. Through my testing, I discovered that lithographic inks do not contain true metals, rather synthetic pigments that do in fact burn out in the kiln at low temperatures, a cone 05 and 06. So, my initial theory of being able to print with lithographic ink was debunked.

I tested various inks, pigments and processes. My conclusion is that it is possible to lithographically print decals on ceramic waterslide paper using a tint base/litho varnish ink mixture, dust it with a pigment/frit mixture, and fire it at low temperatures; thus creating an entirely new piece or work that keeps identifiable qualities that are trademarks of ceramics and lithography.

History of Syracuse China

"Opening originally as the Onondaga Pottery Company (O.P. Co.) in 1871, manufacturing began with only earthenware products. However, with James Pass joining the company in 1885, he developed a new translucent chinaware that put O.P. Co. on the world map. They were the first company to produce American-made vitreous china by the early 1890s, and by 1895 "Syracuse China" appeared as the back-stamp. All of this led to O.P. Co.'s china being used in hotels, clubs, airplanes, trains, cruise ships, and restaurants all over the world. Part of what made Syracuse China so popular was the specific process and quality control that went into each piece.

At the close of WWII, the Onondaga Pottery Co. produced almost 60 million pieces of ceramic for the wartime efforts. Men eventually began to return to work, but the workforce at O.P. Co. remained predominantly women. Another large shift happened to the company in 1966 when it was decided that the name of the company be changed to "Syracuse China," to match its back stamp. The company's president at the time, William Salisbury, announced the change in name was because of "the broad national and international identification of the product name with the company."

The Syracuse China Company continued to produce ware all the way up to its final day of production, April 6th, 2009. The 275 employees who worked at the Court Street factory were devastated by this closure, as many of them had more than 20 years of service at the company. Upon closing, all of the business records and documents, decals & other designs, tools, and tens of thousands of pieces of ware were acquired by the Onondaga Historical Association for preservation and interpretation. All unique and significant pieces were accessioned into the collection and, some, are on display in the permanent Syracuse China exhibit."[1]

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[1] Hunter, Thomas. "Onondaga Pottery Company Changes Name to Syracuse China." *Onondaga Historical Association*, Jan.. 2017.

Syracuse China's Iconic Patterns

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Glossary of Terms

Bisqueware or Biscuit Ware: unglazed porcelain or pottery that has been fired once.

Ceramic Glaze: a mixture of powdered materials that often includes a pre-melted glass made into a slip that is applied to a ceramic body by spraying or dipping. When fired it creates a glass coating on bisqueware.

Ceramic Vessel: a hollow container, especially one used to hold liquid, such as a bowl or cask.

Ceramic Ware or Ware: made of porous clay fired at low heat.

Decal: a picture, design, or label made to be transferred (as to glass or ceramics) from specially prepared paper. In this case I printed on waterslide decal paper specifically designed to be fired in a kiln.

Dusting: refers to applying a fine powder to a substance that it will adhere to, while being removed from the areas that it doesn't adhere to. In this case, we are "dusting" printed ink with a powdered pigment.

Image Area: refers to the "positive" areas of an image, ie. the ink areas of a printed drawing, or the grease receptive (ink-receptive) areas on the matrix.

Onglaze: (of painting or decoration) done on a glazed surface.

Mason Stain: powdered pigments made of a combination of oxides and frits that create beautiful uniform rich colors. You can add mason stains to dry glaze recipes to produce color in an opaque or transparent base glaze.

Matrix: In printmaking, a matrix is the physical object that contains the design which can be inked and printed many times. In traditional lithography, the matrix is either an aluminum plate or a lithographic limestone.

Pigment: a fine powder that carries a hue, typically used for mixing paint, ink, or dye.

Planographic: relating to or denoting a printing process in which the printing surface is flat. The technique for producing a lithograph is called planographic because the printing surface is a flat plane and is neither built up nor cut into.

Stone: refers to the traditional matrix used in lithography (limestone) which has been made perfectly flat and level and grained to a smooth surface for drawing and printing.

Substrate: in printmaking, this refers to the surface on which a design is printed, such as paper, fabric, wood, plastic, etc.

Vitreous: like glass in appearance or physical properties.

Waterslide Decal Paper: is a specialty paper that is activated when placed in water. It is composed of a thin film of dextrose corn sugar that has a backing sheet attached to it. The decal is placed in water and the backing slides off and the sticky dextrose on the back of the decal is activated and ready to be stuck to a smooth surface.

Purpose and Intent of Research

The purpose of this research is to try and resurrect the method of lithographically printed decals for ceramic wares. My goal is to reunite these art mediums that both utilize an extreme technical finesse and create a bridge that will open up more collaborative possibilities between the two art forms. To my knowledge, there is not a lithography workshop or ceramic studio that uses this traditional way of creating decorative work.

I intend to find a method of printing decals using traditional lithography methods and basic ceramic glaze/pigment knowledge that can be applied to ceramic wares, vessels, or sculptures. A goal of my research is to find a method that allows the unique qualities of lithography and ceramics to come together and create a “new” avenue of expression for artists, especially those who work more three-dimensionally. Having the ability to work sculpturally as well as in a planographic manner is an artistic approach that is increasing in popularity, especially in the printmaking world. My research has the potential to bring in a more diverse group of artists and introduce them to a different way of working; a continuation of bridging the gap between the two and three-dimensional.

Step-by-Step Summary

The following is a step-by-step guide that allows you to print lithographic decals that can then be transferred as an onglaze decorative element to a ceramic piece that has been bisque fired and glazed at low temperatures.

STEP ONE:

Create a drawing on any traditional lithographic matrix. For my tests I used a medium gray stone grained to a 220 grit as well as an Eagle POS 1 Positive Working Lithography Plate. Both test matrices had grayscale bands made with various lithography drawing materials to show a variety of textures. Each image was processed according to what the matrix required to create a stable, printable image.

STEP TWO:

Using a stiff tint base ink; I used Hanco® Stiff Base 21-5901, and a lithography varnish; I used Hanco® Body Gum 25-2600, create an ink body that is suitable for your image. You may need to add a #7 or a #5 varnish to your recipe if your image has delicate linework that won't print with a stiffer ink.

*If printing from a stone or an aluminium ball grained plate, it may be a good idea to pull an impression or two in roll-up black to see what detail your image is actually able to print. This will help when printing in the transparent ink and give you a guide as to what your transparent ink consistency needs to be at when preparing to print your decals. Do keep in mind that leather rollers are able to capture more detail than a composite roller, so your impressions in Shopmix and your decal printing in a transparent base will not be exactly identical and will have some minor variations depending on the complexity of your drawing.

Video still from research video shot by Ryan Alison at Tamarind Institute; printing stone in tint base/body gum ink recipe

STEP THREE:

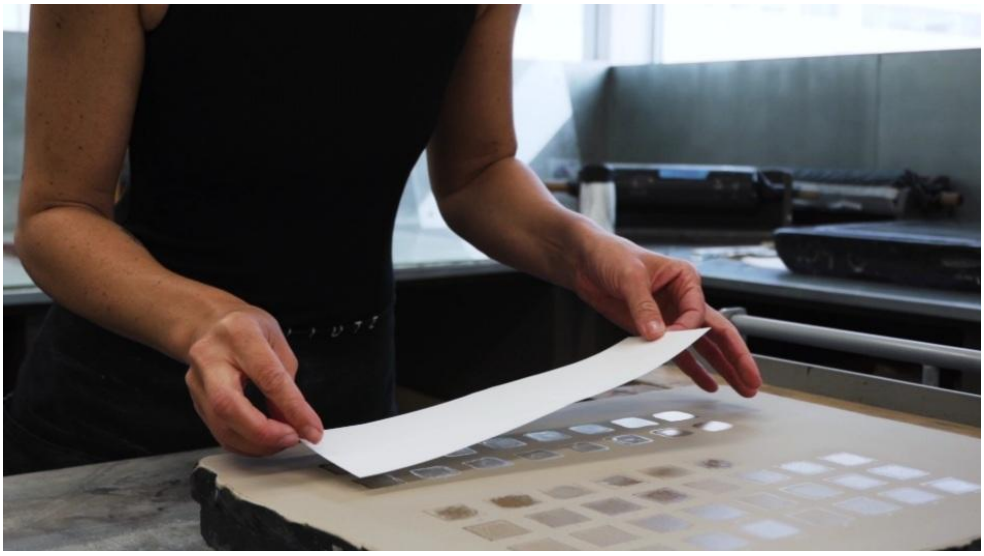
If printing a stone or aluminium plate, begin prepping for printing as you normally would with a washout and a printing base. Slowly bring up your image in your transparent ink recipe, pulling newsprints and adding passes to allow your image to become full. If printing a photo plate, just approach printing as normal, pull an initial newsprint and ink until the image area is full.

* The waterslide decal paper does not have the absorbent qualities of a rag paper, therefore the ink film of your image does not need to be as heavy as if you were printing into rag paper. There is nowhere for the ink to sit except on the surface of the specially designed decal, be aware that over inking may cause squishing of the image when run through the press.

STEP FOUR:

When your image is full and ready to be printed, place your decal paper on your dry matrix and print as you would with any regular printmaking paper. I used Fired-On Images® Laser

Printer Transfer Kit for Ceramic and Glass decal paper. This paper only comes in 8.5”x10” sheets, however your image does not need to be in that specific of an orientation. The Syracuse China decal stones housed decorative designs for multiple pieces. The decals can be maneuvered fairly easily and be strategically placed.



Video still from research video shot by Ryan Alison at Tamarind Institute; printing waterslide decal in transparent base

Photographed by Ron Wyffels; Syracuse China decal stone

STEP FIVE:

Once you pull your impression, dust the wet ink with your choice of pigment or Mason Stain® using a soft bristled brush. I used a mixture of 1tsp MS 6030 Mango ⅛# and ¼tsp Frit 3134 for these tests. Pile up the pigment and allow your impression to dry with the powder for a few days. You can add driers such as Three-Way or Cobalt to your ink if you want to speed up the process. (Cobalt does not affect the color of your Mason Stain® when added to the ink, Three-Way was not tested). Once your ink has dried and the mounds of pigment are ready to be removed, dump off the excess (this can be saved for multiple uses). Using a soft bristled brush, sweep away any leftover residue from the dusting process. A low pressure air hose can be used, but may lift off more pigment than you intend, so be gentle.

*adding Frit 3134 to a pigment or Mason Stain® allows for better melting of pigments into the previously applied glaze for the onglaze process.

Mason Stain® Sample Set

Soft bristled brush, Mason Stain®/Frit 3134 mixture, and tint base ink recipe

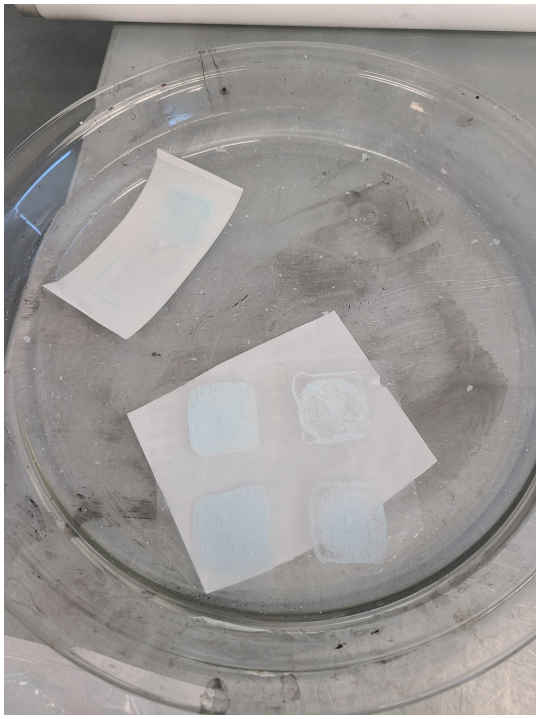
Mason Stain® with soft bristle brush

Video still from research video shot by Ryan Alison at Tamarind Institute; gently tap off pigment onto your went ink, leaving the piles to set while ink dries

STEP SIX:

Once all excess pigment or Mason Stain® has been removed, your decal is ready for placement. Place about an inch or so of warm water into a wide, shallow container. I used a

pie plate, but a photo developing tray would be ideal. Gently place your decal in the water bath, image side up. The edges will instantly curl. Simply poke down and submerge the entire decal sheet. There will more than likely be pigment particles that float off or look like they are running off your image, this is normal and you will not lose imagery. It only has to soak for a few seconds, if you leave it too long, the decal will separate from the backing sheet and depending on the size of your image, this will cause issues. Lift the decal paper out of the bath, you can dip it a few times to allow for the excess pigment to float off and water to drip. * If soaking multiple sheets in a row, replace the contaminated water each time, otherwise the floating pigments will linger and potentially attach to your new decal sheet.



Floating decal paper. Note that the bottom decal sheet has separated from its backing. It is small enough that it didn't cause issues, but larger images could potentially be more of a struggle to place on the wares.

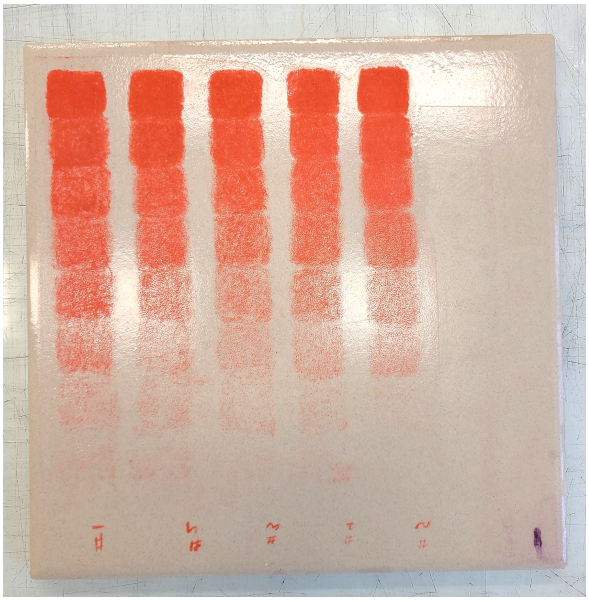
STEP SEVEN:

Your decal is ready to be placed on a glaze fired ceramic ware. Place the image in the general area you wish it to be attached to the ware. I used a commercially bisque fired ceramic white tile that I glazed with Sax True Flow Gloss Glaze®, Natural Clear 229173 and fired it at a cone 05. You should be able to easily slide the clear decal away from the backing sheet, just enough to get a starting edge. Hold down an edge of the decal that has been removed from the backing sheet, grab the white backing sheet and pull. It should very easily slide out from under your image, leaving the clear decal containing your dusted print behind on the ceramic ware. Straighten any edges or smooth any major wrinkles that may have occurred from the backing sheet slide. Place a sheet of newsprint on top of the decal and using a soft rubber brayer, roll it across the newsprint. This will "squeegee" out excess water and air bubbles, be sure not to press too hard, just gently roll the brayer.

STEP EIGHT:

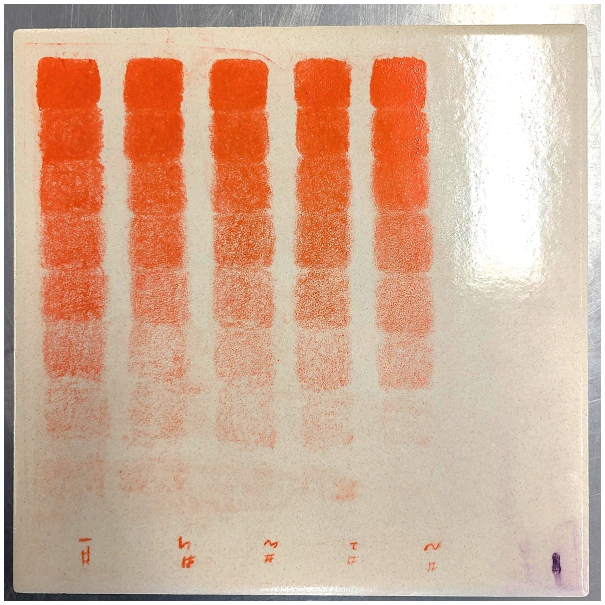
Your ware is ready for its final firing. I fired the test tiles at a cone 06, but depending on the glaze you are sliding the decal onto, may depend on how you fire the decal. A relatively low fire should be enough to let the initial glaze to melt slightly and allow the pigment/Mason Stain to melt into each other.

BEFORE:



Decal transferred and "squeegeed" to ceramic ware

AFTER:



Finished product after last firing

Materials and Equipment

INKS, VARNISH, AND MODIFIERS:

- Hanco® Stiff Base 21-5901
- Hanco® Stiff Opaque White 21-6100
- Hanco® Body Gum 25-2600
- Hanco® Litho Varnish #5 MS 1113
- Hanco® Litho Varnish #7 MS 1114
- Hanco® Cobalt Drier MS 1000
- Graphic Chemical® Shop Mix Black Ink
- Cranfield® Rubine Red
- Cranfield® Pyrazolone Orange
- Cranfield® Diarylide Yellow
- Cranfield® Yellow Ocher
- Cranfield® Phthalo Green
- Cranfield® Phthalo Blue-Green Shade
- Cranfield® Ultramarine Blue
- Cranfield® Raw Umber
- Cranfield® Carbazole Violet
- Cranfield® Opaque White

CERAMIC MATERIALS:

- Mason Stain 6304 Violet ⅛#
- Mason Stain 6242 Bermuda ⅛#
- Mason Stain 6376 Robin's Egg ⅛#
- Mason Stain 6030 Mango ⅛#
- The Ceramic Shop® Frit 3134
- Sax True Flow Gloss Glaze®, Natural Clear 229173
- Duncan® Pure Brilliance® Clear Glaze Brush-On
- White clay bisqueware ceramic tiles 6"x6" (unglazed, commercial grade)
- White clay/white glazed ceramic tiles 4"x6" (commercial grade)
- Skutt Electric Kiln (courtesy of UNM's Ceramic Department)
- Fired-On Images® Laser Printer Transfer Kit for Ceramic and Glass decal paper

DRAWING MATERIALS:

- Korns® #1, #1, #3, #4, and #5 Litho Pencils
- Charbonnel® High Grade Paste Tusche
- Black Prismacolor Colored Pencil (used to make grayscale on frosted mylar for photoplate test)

MATRICES:

- Medium Gray Lithographic Limestone
- Eagle POS 1 Positive Working Lithography Plate
- Ball-grained Aluminium Plate (used as a dry-roll flat plate)

Test Procedures and Results Summary

TEST ONE:

This first test was a color test to see if any of the Cranfield Traditional Litho® inks had similar metals that are used in ceramic glazes. I hypothesized that if both contained the same raw pigments then they should function the same in the kiln. I created dry roll flats of various colors and printed them on the waterslide decal paper. I created little color grids on the tiles and fired them at a cone 05 to test the results.

BEFORE:

AFTER:

CONCLUSION: Pigments in Cranfield® litho inks are synthetic and not raw pigments that can withstand the heat of a kiln when fired at cone 05. Therefore you are unable to print with regular lithography inks and yield similar colors as you would with a ceramic glaze. More tests with different ink brands will need to be done, but I think the results will more than likely be the same.

TEST TWO:

I created a printing ink using 45 parts Hanco® Tint Base, 45 parts Hanco® Litho Varnish #7, and 10 parts Hanco® Litho Varnish #3. Using a pestle and mortar I added the ink to 1tbs of MS 6242 Bermuda ⅛# and ¼tsp frit 3134, incorporating the pigment into the ink. This created a fairly grainy printing. I theorized that the potential of printing in a ceramic pigment/litho ink combo could be a possibility.

NO IMAGES: test tiles came out completely blank like the “After” image from test one

CONCLUSION:

The ratio of pigment to ink was way too low and in the end when it was fired there was not enough pigment to hold up in the kiln. The pigment particles are too large to be printed with traditional lithography inks. Other tests could be done using a triple mill to further break down the ceramic pigments and incorporate them more fully into lithography inks.

TEST THREE:

Using the traditional method of printing Syracuse China decals, I created a grayscale drawing with traditional litho materials, printed it as your would any litho stone using a transparent ink recipe, dusted it with a Mason Stain®/frit mixture, and fired the ware at a cone 06 to yield a successful lithographically printed ceramic decal.

NO IMAGES: test tiles came out completely blank like the “After” image from test one

CREATE A DRAWING:

I started with creating a simple grayscale drawing on limestone using Korns® Litho pencils #1-#5 as well as tusche washes made with Charbonnel® High Grade Paste Tusche. These gray scale bands were similar to P1 and P2 of Tamarind’s Printer Training Program projects. The stone was processed normally with a first etch, roll-up, and a second etch put on.

PRINTING THE DRAWING:

I mixed an ink recipe of 75 parts Hanco® Tint Base, 15 parts Hanco® Body Gum, 10 parts Hanco® Litho Varnish #7, and a toner of Hanco® Cobalt Drier for printing the decals. I washed out the stone and began bringing up the image in the transparent ink as you would any other stone drawing. I then pulled an impression on the Fired-On Images® Laser Printer Transfer Kit for Ceramic and Glass decal paper.

DUSTING THE WET INK:

I mixed a dusting pigment using 1tsp MS 6030 Mango ⅛# and ¼tsp Frit 3134. Using a soft bristled brush I picked up the pigment and tapped it onto the wet ink, leaving piles of pigment to rest on the ink while it dried over a period of three days.

APPLYING THE DECAL:

Once the ink was dry, I removed the excess pigment by dumping the piles off and gently dusting off the remaining particles with a soft bristled brush. Then, following the instructions on the Fired-On Images® Laser Printer Transfer Kit for Ceramic and Glass decal paper, I soaked the decal in warm water. Then, gently slid the image off onto a pre-glazed and fired ceramic tile. From there, I "squeegeed" off the extra water and removed air bubbles using a sheet of newsprint and a soft rubber brayer.

FIRING CERAMIC WARE:

From here, your piece is ready for its final firing. I was fortunate enough to have the use of the UNM Ceramic Department's kilns where my tiles were fired at a cone 06. The frit mixed into the Mason Stains® allowed for the pigment to melt evenly into a pre-glazed ceramic tile. I had previously clear glazed this tile with Sax True Flow Gloss Glaze®, Natural Clear 229173 and fired it at a cone 05. This test yielded the best results.

Conclusion

The results of my tests have shown that it is possible to successfully print lithographic ceramic decals using the Syracuse China decal onglaze method. This method of printing in a transparent ink and then dusting with a ceramic pigment produced an image that kept its lithographic qualities, which was one of my main concerns in this research process. The dusted image held up in the kiln and the colors were just as vibrant going in as they were coming out. Mason Stains® are an extremely reliable color match; however, more tests will need to be done using various raw ceramic materials. With this research it is possible to rejuvenate a lost process. I plan to continue testing pigments and imagery to see how far I can stretch this marriage of printing and pottery.

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