Floored, Robert Dawson, 2008. 45 x 45cm (17¾ x 17¾in), print on ceramic tiles.

5 Screenprinted waterslide transfers: the basics

The prime method of ceramic transfer printing is the waterslide transfer or decal. This chapter describes how to make both water-based and solvent-based versions.

Basic principles of screen-printing in general

The original screenprint process involved the use of a piece of silk, which accounts for the term 'silkscreen printing'. Because today the mesh is usually made of manmade fibre the terms 'screenprinting' or 'screen-process printing' are more accurate. Other terms have been used, including 'serigraphy' and 'mitography'. The term 'serigraphy' was coined in order to distinguish artists' screenprints from those produced commercially. 'Mitography' is a term devised by Albert Kossloff in 1942, derived from Greek words meaning 'threads' or 'fibres' and to 'write' or 'print'.

For the studio-based artist an important consideration when making screenprinted transfers will be what kind of imagery you want to make and perhaps more importantly what access to screenprinting equipment you have. Most studio-based artists will not have a fully equipped print studio themselves, but they might be able to hire equipment from an open-access studio, local college or university, or from other artists. If you do have access to a screenprint studio you should be able to coat your screen with a light-sensitive emulsion and expose this to UV light with a positive of the required artwork to achieve a resilient and accurate stencil on the screen. This approach is dealt with in Chapter 7.

However, many artists who want to make transfers will not have such access, and approaches in this context are covered in Chapter 6. The current chapter shows the process for making a transfer – assuming that an image is already on the screen – using a light-sensitive emulsion, because I think it is important to explain the principles of transfer printing first. You can then refer to the next two chapters in considering the approach that suits you best.

When I teach classes on screenprinting, I always say that it can be difficult to understand each stage of the process until you have seen it or done it in its entirety. This chapter aims to show and explain the process, but of course there is no substitute for seeing or doing at first hand. So if you are unfamiliar with screenprinting, I would advise that you try and take a class. Another thing I often say when teaching is that when one first sees the screenprinting process it can seem rather long and complicated. However, I really believe that once the basics are mastered making screenprinted transfers is a very quick and relatively easy method.

It is important to note that screenprinting is an art form in its own right, and

the methods in this book can be applied to printing onto paper as well as ceramics. Remember that you would need to use ink that is appropriate for paper rather than ceramic ink. You might also want to seek inspiration for your ceramic screenprinting from books on screenprinting for paper.

A step-by-step guide for making a water-based transfer

Preparing to print

The ideal situation for printing a transfer is a standard vacuum hand bench for screenprinting. This firmly holds the screen in place and has a vacuum underneath the bed where the paper is placed. The vacuum pump sucks air through small holes in the bed and holds the paper in position during printing. This is important when printing several colours as slight movements of the paper can cause the various colours to be misaligned on the final print. This form of printing bench is expensive, but small versions are available.

You can also use a simple setup comprising a wooden screen hinged to a board. As there is no vacuum you might need to tape the paper to the baseboard to stop it moving or sticking to the screen during printing. This is OK for printing small numbers of prints, but longer runs would be rather time-consuming. There is also a danger of water-based ink drying in the screen, so you will have to work quickly.

For single prints or where registration is not vital you can just position the screen over the paper and print. You may have to get someone to hold the screen in place. A few small pieces of card should be taped onto the corners of the screen to lift it above the surface of the paper. About 4mm (¼in) should be sufficient.

The illustrations in this section show a standard vacuum hand bench and the printing of a water-based transfer (see p.55). I am a great believer in carefully setting up prior to printing, as short cuts are likely to cause problems in the long run. Having prepared your screens with a stencil, you now need to tape up areas of the screen not covered by the emulsion. Brown plastic parcel tape is good for this, and helps when cleaning ink off the screen as the tape stops ink getting trapped in the corners. Cut the tape to the length of the inside of the screen, taking care not to damage the screen with sharp scissors. Pulling the strip of tape taut helps fit it into the corner of the screen. Smooth it down so it is as flat as possible. Avoid using several bits of tape that do not stretch across the whole screen as these can get pulled off by the squeegee.

Attach the screen to the printing bench. Position your transfer paper underneath the screen so that the image will print in the correct place – for example, in the middle of the paper. Do not be tempted to try and print right up to the edge of the paper. I would leave around a 2.5cm (1in) gap between the paper edge and print. It might help if you attach the original positive to the paper in the position that you want the print to go, and then look through the screen, pressing down slightly, and position the image on the positive with the corresponding areas of open mesh. Remember to remove the positive before printing. Once the paper is in the correct position you should mark its location by placing three strips of card with masking tape flush against

the edges as shown in the illustration on p.55. This is especially vital when you intend to print more than one colour, as you will need to register the paper each time you change the colour to ensure that it is printed in the correct place.

It is now important to set the 'snap'. This is the distance between the screen mesh and the surface of the paper. The mesh should not be touching the paper, as this will cause a blurred image when you print. In order to lift the screen to create the snap distance you should adjust the setting by turning the knobs on either side of the printing bench.

If you are using a wooden screen hinged to a board or just holding the screen over the paper, tape some pieces of card either to the front corners of the screen (all four corners if holding the screen) or onto the baseboard to correspond to the corners of the screen. The snap should be around 4mm (¼in) for a tight screen, a distance you can feel by gently pressing the surface of the mesh onto the paper below. If the screen mesh is slack use a greater snap distance.

Once your screen is on the bench, paper registered and snap set, you should place scrap paper (newsprint is good) around your transfer paper on the bed of the bench to block the holes not covered. This focuses the vacuum on your transfer paper and also helps to keep the bed clean should you drop ink onto it. Leave a gap of around 2.5cm (1in) between the scrap paper and the transfer paper. Tape the scrap paper down, as you don't want it moving around when you are concentrating on the printing.

I always like to print a test onto scrap paper before printing onto the transfer paper. This allows me to check that the image is as I want it and that the ink is thick enough. This can help avoid wasting expensive transfer paper. In screenprinting the first print is usually lighter than the rest, so printing the scrap paper first means that your first print onto transfer paper will be stronger. If you have a very detailed image – like a fine halftone, for example – you could just print directly onto the transfer paper in the hope of getting the sharpest possible image.

Mixing the ink

Once the screen is in position you should prepare your ink. Some inks may be supplied ready-mixed, in which case you can use them straightaway. However, if you have powdered enamels, underglazes, in-glazes or oxides, you will have to mix them with a printing medium.

The manufacturers of specific printing enamels will supply information on recommended mixing ratios for enamel and medium. I use TW Flat Clear Base as a 'water-based' medium, and tend to mix the ink by 'feel' as opposed to measuring quantities. After a little experience you will be able to judge the correct quantities. You should add the enamel powder to the medium and stir it thoroughly. The consistency of the ink should be quite thick, perhaps like yogurt. Remember that if the ink looks thin on the paper after you have printed it, it will still look thin once you have fired it onto ceramic. If this is the case, you might want to clean the screen down, add more enamel to the ink, and start again. This will save you time in the long run.

If you are only printing a small number of transfers, there is no need to mix a large quantity of ink. Enough for a generous line of about 2.5cm (1in) wide corresponding to the length of the squeegee will be adequate. Use a plastic spatula to mix the ink, as this can then be used to clean the screen after printing. Metal implements should not be used on the screen mesh as they can split the screen.

In industry the ink is usually mixed through a triple roll mill to create a homogenous mix. For the small-scale user a glass muller and a sheet of sandblasted glass can be used to mix the ink. A pestle and mortar is another quick option. However, in my view none of the above are strictly necessary unless you need to achieve a very precise flat area of colour where spots of unmixed enamel might cause a distraction.

Experienced printmaker David Fortune uses Daler Rowney products to make water-based transfers using the following recipe and guidelines. For on-glaze printing and enough for about six A4 decals:

1 Start with one heaped teaspoonful of Daler Rowney Glaze Medium Gloss.

2 Add one flat teaspoonful of liquid acrylic retarder and mix this small amount together.

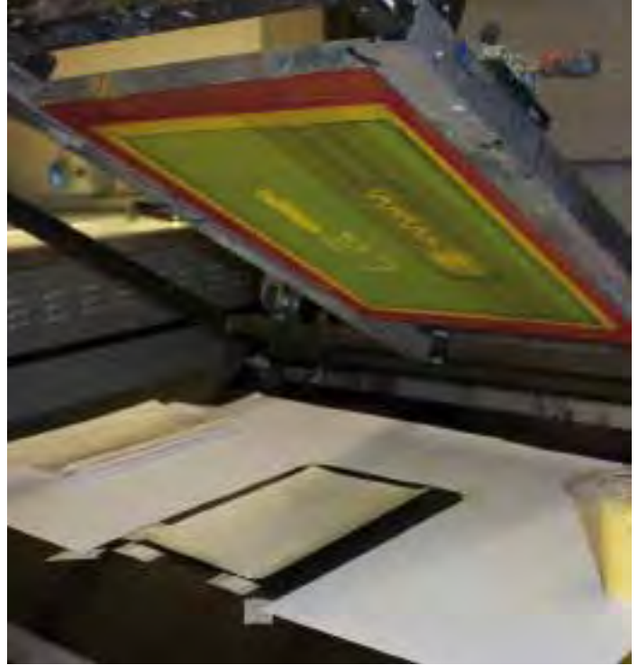
3 Now add three heaped teaspoons of powdered on-glaze enamel. **Caution: The on-glaze enamel is dangerous in powder form. It is much safer when wet. Add the powder in the open air, or use an extraction box, and be very careful. DO NOT breathe in any of the enamel powder.** Mix together thoroughly. You will notice that it is a little more gelatinous than acrylic inks for paper. The final mix by volume is approximately 70:30, enamel to medium. This ratio can vary depending on the colour of enamel you are using.

As with all materials you should follow the manufacturer's health and safety guidelines. **With enamels you should wear a mask to avoid breathing in the powder, and you should also be careful not to leave enamel on work surfaces where others might pick it up on their hands and ingest it.**

Printing

You are now nearly ready to print. If you are using TW Flat Clear Base water-based ink, there is an important last step. This ink dries very quickly due to cross-linking of the polymers in the medium. The application of a mild alkali to the screen helps to slow this down. Mr Muscle, the proprietary kitchen cleaner, works well. Spray the screen lightly on the top and bottom, taking care not to wet your transfer paper. Then wipe dry with a paper towel.

To print, pour a pool of ink along the bottom width of the screen, which is slightly longer than the length of the squeegee. Take the squeegee and push the ink forward to the top of the screen whilst holding the screen off the area to be printed so that the paper is not printed. This is called 'flooding the screen' and is important because it deposits an even coating of ink into the mesh and helps prevent the ink drying in the screen between prints. Having flooded the screen, put it down and place the squeegee



LEFT: The screen on the vacuum bed ready for printing. Note that transfer paper, ink and squeegee are all ready to hand before printing begins.

RIGHT: Lower the screen, push the squeegee down to make contact with the transfer paper below and pull the ink forward to print.

blade behind the line of ink at the top of the screen. Hold the squeegee at an angle of about 60 degrees and pull forward. This will push the ink through the mesh and onto the paper below. Lift the screen and flood to prevent the ink from drying in the screen. Quickly remove and check the print. If you are satisfied with the image, place another piece of paper under the screen in the registration marks and print. If you are printing more than one sheet remove the printed piece to somewhere safe, place another in registration and continue, remembering to flood after each print stroke.

When you have finished printing place some scrap paper underneath the screen, gather as much ink as possible and pull it with the squeegee to the front of the screen. You can then lift most of the ink up off the screen and onto the squeegee. Return the ink to the pot where it may keep for a short while if covered. Then clean down the screen. Mr Muscle with water is good for cleaning water-based inks. You might find that the screen looks a little stained towards the edges of the print area; don't worry, as this usually disappears when you wash off the stencil with Pregasol F and a power washer. Don't forget to clean the squeegee as well. It is important to clean your screen and tools quickly, as the ink dries very quickly and might not be removable once dry.

The key differences when making a solvent-based transfer

Printing covercoat

When using solvent-based mediums it is important to use a studio with the appropriate extraction facilities. If you are working in an educational establishment or open-access print studio, the technical staff will advise you. If suitable extraction is not available, it is possible to print basic transfers outside using a hinged screen attached to a baseboard.

The ink should be mixed in a similar manner and to the same consistency as

with water-based printing, but you should use a solvent-based medium for transfer printing. After printing, the screen should be cleaned with a solvent. The manufacturer of the medium will recommend the appropriate cleaning agent.

Once the prints are dry you can covercoat them. To do this you must first make another screen stencil that will completely cover your image with about a 5mm (¼in) overlap. You can make the artwork for this by painting black ink or photo opaque onto drafting film, True-Grain or Mark Resist, or by cutting the shape out of card. This is then used to make a screen stencil as described in Chapter 7. You then screenprint the covercoat over the top of your print having carefully registered it first. You might find that more snap is required. If you were not using a vacuum bed it would be advisable to tape your paper down, as covercoat is rather sticky and can stick the paper to the screen. If this happens, the solvent in the covercoat can cause the ink of the print to dissolve a little and mark the covercoat screen, and this will be offset onto the next print, so it might be best to clean down and start again.

If you only have to covercoat a few prints you can roll the covercoat on thinly with a small sponge decorator's roller. However, this is a rather crude method, so for longer runs it is advisable to print the covercoat.

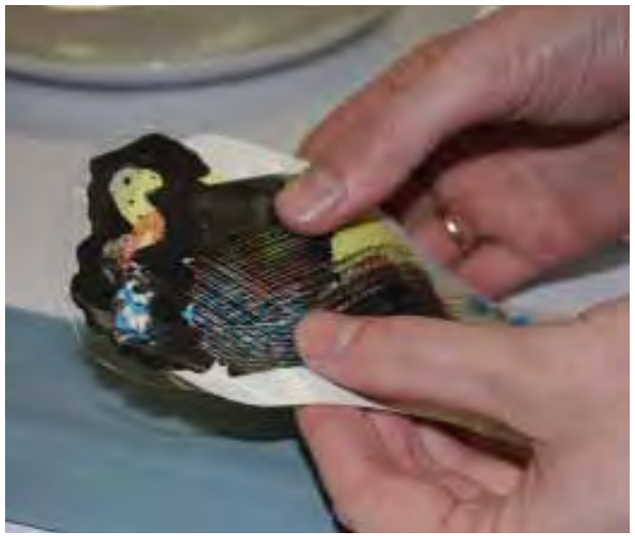
Cleaning off the stencil

When you have finished with a stencil it should be removed with an appropriate de-coating chemical. Specially produced de-coating chemicals are used for this job. The supplier of the emulsion that you use will be able to advise you of the most appropriate de-coating agent.

Place the screen in a washing trough and spray with water on both sides. Spray on the de-coating chemical and leave for two minutes. Gently wash away excess emulsion and chemical and then blast with a high-pressure hose to remove any stubborn areas (wearing an apron, mask, and eye and ear protection). If the stencil is hard to remove you could reapply the de-coating chemical and leave for longer. Once clean, the screen should be thoroughly dried before recoating. It can be dried in a special drying cabinet or placed in front of a fan heater. Be careful not to overheat the screen as it may split the mesh. Screens can also be left at room temperature to dry. If you have used a solvent-based ink you will have to degrease the screen after removing the stencil. Screenprinting suppliers will advise on the appropriate products for this, although vinegar can be used as a basic degreaser.

How to apply a waterslide transfer

The application of water-based and solvent-based transfers is very similar. After printing, it is best to leave transfers to dry overnight, although with care some water-based transfers can be used very soon after printing. Cut out the transfer leaving about 4mm (¼in) around the image.



LEFT: After wetting the back of the transfer, wait a few minutes until the covercoat layer and image separate from the backing paper.

RIGHT: Whilst holding the transfer in position, gently slide the backing paper from underneath.

First wet the transfer by placing it under the tap and wetting the back or by dipping it into a bowl of water. Then leave it for a few minutes. If you are going to apply several transfers, they can all be wetted at once and left on a plate.

Do not leave a transfer floating in a bowl of water as the residue of the gum layer will be washed away and the transfer may not stick to the surface of the glass so well. Once wet a transfer will curl up; when it flattens out again it should be ready to transfer. After a few minutes you should be able to hold the transfer between your thumb and forefinger and gently move the covercoat and image layer away from the backing paper. Do not completely remove the backing paper until you are ready to apply the transfer, as it is very flimsy and will be difficult to handle.

Make sure that the object to be decorated is perfectly clean. Methylated spirits (solvent alcohol) can be good for this, but hot water is just as good. Wet the surface of the object with water and then place the transfer image side up in the approximate position that you want it. Gently slide the backing paper out from underneath the covercoat/image layer. You can then correctly position the transfer.

Wetting the surface of the object prior to applying the transfer allows the transfer to slide around. Heating the glazed piece before you apply the decal helps with the elasticity of the transfer. Once it is in the correct position the excess water underneath the transfer should be removed. This can be done by gently smoothing down the transfer with a rubber kidney of the kind used in ceramics. Working from the centre outwards make sure that the transfer is in full contact with the surface of the glass and that all air bubbles are removed. Any remaining moisture can be removed with a paper towel.

You should avoid creases in the image area as these may show up once fired. Creases left in the clear areas of the decal are fine as the clear backing burns away when fired. Leave for an hour or so until dry. The ceramic piece is now ready for firing.

Possible firing schedules

These firing times and temperatures are for bone china/porcelain and may vary for different glazes. If the transfer looks matt when it is fired, it could be underfired, so you could try firing it again at a higher temperature. If it is blurred, shiny and the colour has faded, it could be overfired. Unfortunately, this cannot be remedied.

For black and colour on-glaze:

1st Ramp: 80°C (144°F) per hour to 80°C. 2nd Ramp: 100°C (180°F) per hour to 760°C (1400°F), followed by a soak at 760°C (1400°F) for 1 hour. Orton Cone: 0.16 to 7.30–8.00 o'clock. Blacks can often be fired much higher – say 850°C (1562°F),

For on-glaze reds:

1st Ramp: 80°C (144°F) per hour for 1 hour. 2nd Ramp: 100°C (180°F) per hour to 740°C (1364°F), followed by a soak at 740°C (1364°F) for 1 hour 20 min. Orton Cone: 0.17 to 7.30–8.00 o'clock.

For underglaze colours:

Apply the transfer to bisque ware. A coating of shellac can help adhesion of the transfer. Fire the transfer at around 600°C (1112°F) to remove covercoat and medium. Glaze the piece and fire the glaze as you would normally.

For in-glaze:

Print the transfers with oxides or underglaze colours and apply to glazed ware. Re-fire the piece to the glaze temperature or just below.

CASE STUDY: One-day workshops

The speed of transfer production offered by water-based methods means that they could be useful for one-day workshops as well as for the busy individual artist/designer who needs quick results in the studio. I have run transfer-printing workshops for schoolchildren where we have started at 9.30 in the morning and finished at 3.00pm with transfers designed, printed and applied to mugs. They then have to be fired overnight, but the speed of printing is very quick.

I often use a 'self-portrait' theme or a 'self portrait that says more about you than just what you like'. I might start these sessions by asking students to make quick large-scale drawings on paper before making their transfer designs. This can help to build their confidence with drawing.

Rachel Leatherland from The King's Academy, Middlesbrough, showing her 'self-portrait' mug just designed, printed and transferred during a one-day workshop.

BELOW: When designing transfers it is important to remember that one of the advantages of transfer printing over direct printing is that you can decorate all surfaces of ceramic objects. Here 15-year-old Nathan Falcon has cleverly printed a design of the front and back of his head on the outside and inside of a mug. *Photos: Kevin Petrie.*